

Information about the Ecodesign Regulation (EU) 2019/1781 for Motors and Drives from CAPIEL and CEMEP

Please be aware this information cannot replace the Regulation (EU) 2019/1781. In case of conflict between this information and the regulation, the regulation (EU) 2019/1781 takes precedence.

Note: The European Commission is working on an omnibus amendment to the Ecodesign Regulations including the Regulation (EU) 2019/1781. This omnibus amendment is not a review of the Regulations that have been adopted. The amendment is limited to corrections and clarifications of the eco design regulations. The amendment is expected to be published in early 2021. After that, this information will be reviewed, and a 2nd Edition will be published.

1. Introduction

CEMEP the European Committee of Manufacturers of Electric Machines and Power Electronic, and CAPIEL the European Coordinating Committee of Manufacturers of Electrical Switchgear and Controlgear, are committed to meeting or exceeding the requirements of all European Union (EU) legislation which seeks to protect and improve the environment. Probably the most significant contribution CAPIEL and CEMEP member companies can make, is through optimising the energy efficiency of Motor and Drive Systems. Many studies indicate correct Motor and Power Drive Systems design is essential in order to maximize performance and minimize motor losses (e.g. EuP Lot 30: Electric Motors and Drives, Task 3, Anibal de Almeida, Hugh Falkner, João Fong, April 2014).

- Energy efficient systems are those which are perfectly matched to their applications. Good guidelines for designing an efficient system are IEC 61800-9-1 and IEC 61800-9-2. Power Drive Systems (PDS) consist of one or more of the following components: A Motor that converts electrical power into mechanical power;
- A device for controlling the motors from the power grid, which will usually be either a Variable Speed Drive (VSD) or a soft-starter or a contactor/overload combination. Some applications with a fixed speed do not require a drive, but only a contactor for switching the motor on and off or a soft starter for a soft motor start-up.

In addition, there may be a gearbox that adjusts the motor to the required power and speed of the driven machine. Also, under certain circumstances, the application may need to be matched to a specific load profile.

The Ecodesign Directive 2009/125/EC establishes, across the EU, a framework for setting eco-design requirements for energy-related products. It is a key instrument of EU policy for improving the energy efficiency and other aspects of the environmental performance of products placed on the market.

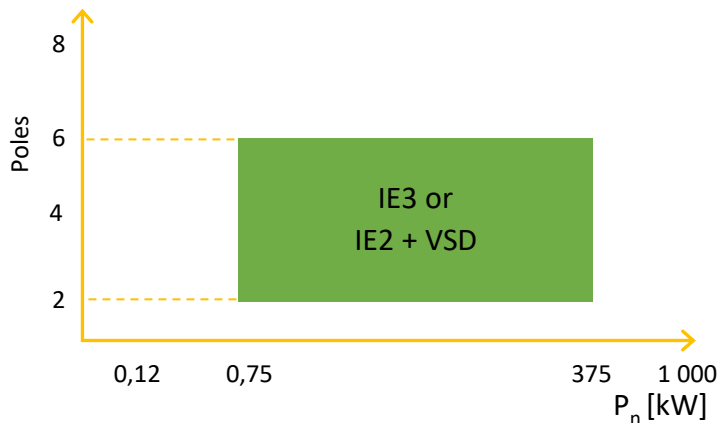
Requirements for the eco-design of electric motors and the use of variable speed drives were set out in Regulation (EC) 640/2009 of 22nd July 2009 and in its amendment Regulation (EU) 4/2014 of 6th January 2014. This regulation was superseded on 25th October 2019 by Regulation (EU) 2019/1781, which sets out new statutory requirements for motors and drives. Until the new requirements take effect, those of the existing Regulation (EC) 640/2009 and the Regulation (EU) 4/2014 continue to apply.

The intention of this information from CEMEP and CAPIEL is to provide information to all stakeholders about the new Ecodesign Regulation (EU) 2019/1781 for motors and drives. However, this information cannot replace the regulation. In case of conflict between this information and the regulation, the regulation (EU) 2019/1781 takes precedence.

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2. Overview of the Regulations

2.1 Regulation (EC) 640/2009 (valid until 30th June 2021; requirements for motors only)



Picture 1: Regulation from 1 January 2017 until 30th June 2021

Applies to	Major exemptions from this efficiency requirements ¹
Induction motors (single speed, 3-phase 50 Hz or 50/60 Hz, induction motor rated for continuous duty, with rated voltage of up to 1000 V).	<ul style="list-style-type: none"> • Motors specified to operate exclusively in potentially explosive atmospheres as defined in Directive 2014/34/EU. • Brake Motors (as defined in the Regulation) • Submersible motors (as defined in the Regulation)
Does not applies to	
This regulation does not apply requirements on the VSD.	

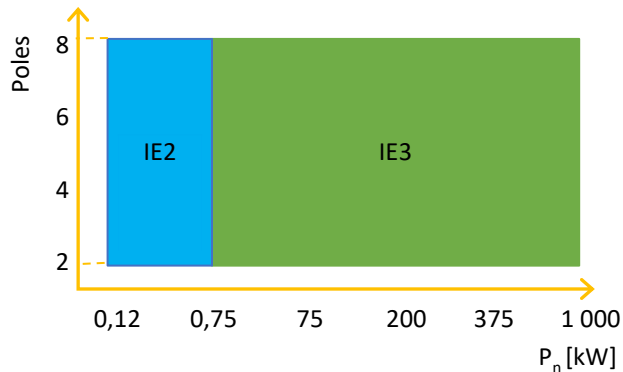
Table 1 applies - exemptions

¹ Other exemptions are:

- (a) motors specified to operate wholly immersed in a liquid;
- (b) motors completely integrated into a product (for example gear, pump, fan or compressor) of which the energy performance cannot be tested independently from the product;
- (c) motors specified to operate exclusively:
 - (i) at altitudes exceeding 4 000 meters above sea-level;
 - (ii) where ambient air temperatures exceed 60 °C;
 - (iii) in maximum operating temperature above 400 °C;
 - (iv) where ambient air temperatures are less than – 30 °C for any motor or less than 0 °C for a motor with water cooling;
 - (v) where the water coolant temperature at the inlet to a product is less than 0 °C or exceeding 32°C

2.2 New Regulation (EU) 2019/1781

2.2.01 Motors - Step 1: Starting 1st July 2021



Picture 2: Starting 1st July 2021

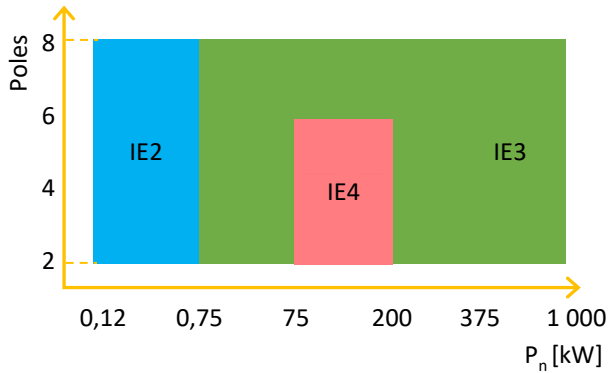
Applies to	Major exemptions from this efficiency requirements
<p>3-phase induction motors</p> <ul style="list-style-type: none"> rated for operation on 50 Hz, 60 Hz or 50/60 Hz supplies and rated for continuous duty i.e. duty class S1, S3≥80%, S6≥80% <p>The following types of motor will have efficiency requirements for the first time:</p> <ul style="list-style-type: none"> pole numbers: 8-poles Motors for explosive atmospheres Ex ec, Ex tb, Ex tc, Ex db Ex db eb and Ex dc, brake motors², Totally Enclosed Air Over (TEAO) motors. <p>“to note”: The option of IE2 + VSD is no longer applicable.</p>	<ul style="list-style-type: none"> Mining Motors¹⁾ ATEX motors Ex eb covered by Directive 2014/34/EU (for explosive atmospheres) Totally Enclosed Non-Ventilated (TENV) motors
<p>Does not applies to</p>	
<ul style="list-style-type: none"> Motors with brushes, commutators, slip rings or other electrical connections to the rotor, often described as multi-speed motors. High-Voltage Motors (define > 1000V) 	

Table 2 applies – exemptions

¹ Group I Mining motors (suggest: as defined in Annex I, point 1 of Directive 2014/34/EU

² With the exception of motors with an integrated brake which forms an integral part of the inner motor construction and can neither be removed nor powered by a separate power source during the testing of the motor efficiency;

2.2.02 Motors - Step 2: Starting 1st July 2023

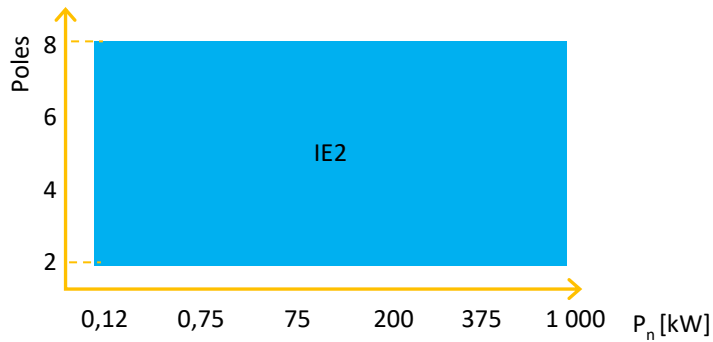


Picture 3: Starting 1st July 2023

Applies to	Major exemptions from this efficiency requirements
<p>3-phase induction motors:</p> <ul style="list-style-type: none"> rated for operation on 50 Hz, 60 Hz or 50/60 Hz supplies and rated for continuous duty i.e. duty class S1, S3≥80%, S6≥80% pole numbers: 2-, 4-, 6- and 8-poles Motors for explosive atmospheres¹⁾ Ex ec, Ex tb, Ex tc, Ex db, Ex db eb and Ex dc, brake motors, Totally Enclosed Air Over (TEAO) motors. <p>“to note” IE4 for 3-phase will become mandatory only for 2-, 4- and 6-poles single speed motors between 75 to 200 kW which are not brake motors, Ex eb increased safety motors, or other explosion-protected motors.</p>	<ul style="list-style-type: none"> Mining Motors¹⁾ Totally Enclosed Non-Ventilated (TENV) motors
<p>Does not applies to</p>	
<ul style="list-style-type: none"> Motors with brushes, commutators, slip rings or other electrical connections to the rotor, often described as multi-speed motors. High-Voltage Motors (define > 1 000V) 	

Table 3 applies - exemptions

¹ Group I Mining motors as defined in Annex I, point 1 of Directive 2014/34/EU



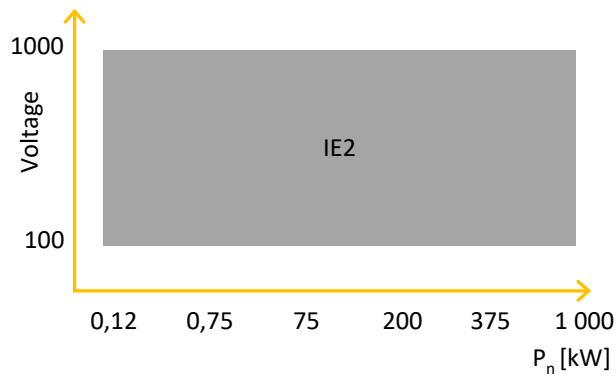
Picture 4: Starting 1st July 2023

Applies to	Major exemptions from this efficiency requirements
The following motors rated for operation on 50 Hz, 60 Hz or 50/60 Hz supplies: <ul style="list-style-type: none"> • 1-phase motors • Ex eb motors for explosive atmospheres 	<ul style="list-style-type: none"> • Mining Motors ¹⁾ • Totally Enclosed Non-Ventilated (TENV) motors
Does not applies to	
<ul style="list-style-type: none"> • Motors with brushes, commutators, slip rings or other electrical connections to the rotor, often described as multi-speed motors. • High-Voltage Motors (define > 1 000V) 	

Table 4 applies - exemptions

¹ Group I Mining motors as defined in Annex I, point 1 of Directive 2014/34/EU

2.2.03 Variable Speed Drives: Starting 1st July 2021



Picture 5: Starting 1st July 2021

Applies to	Major exemptions from this efficiency requirements
<ul style="list-style-type: none"> The regulation covers 3-phase variable speed drives from $0,12 \text{ kW} \leq P_n \leq 1\,000 \text{ kW}$ 	<p>LV AC Drives:</p> <ul style="list-style-type: none"> Regenerative drives (active front end, AFE) Low-harmonic drives (THD < 10%) Multiple AC-output drives 1-phase drives

Table 5 applies - exemptions

2.3 Timelines

Ecodesign		Year and minimum efficiency requirements (2017 onward)		
		Until 30 June 2021	From 1 July 2021	From 1 July 2023
Induction motor ≥ 50 V and ≤ 1 000V				
$\geq 0,12 \dots < 0,75$ kW	3-phase, 2/4/6 pole	-	IE2 ¹	
	3-phase, 8 pole	-	IE2 ¹	
$\geq 0,75 \dots < 7,5$ kW	3-phase, 2/4/6 pole	IE2 + VSD; IE3	IE3 ¹	
	3-phase, 8 pole	-	IE3 ¹	
$\geq 7,5 \dots < 75$ kW	3-phase, 2/4/6 pole	IE2 + VSD; IE3	IE3 ¹	
	3-phase, 8 pole	-	IE3 ¹	
$\geq 75 \dots \leq 200$ kW	3-phase, 2/4/6 pole	IE2 + VSD; IE3	IE3 ¹	IE4 ²
	3-phase, 8 pole	-	IE3 ¹	
$> 200 \dots \leq 375$ kW	3-phase, 2/4/6 pole	IE2 + VSD; IE3	IE3 ¹	
	3-phase, 8 pole	-	IE3 ¹	
$> 375 \dots \leq 1$ 000 kW	3-phase, 2/4/6 pole	-	IE3 ¹	
	3-phase, 8 pole	-	IE3 ¹	
$\geq 0,12 \dots \leq 1$ 000 kW	motors for explosive atmospheres Ex eb, 2/4/6/8 pole	-		IE2
$\geq 0,12$ kW ...	1-phase, 2/4/6/8 pole	-		IE2
High voltage motors, Direct current motors, Group I Mining Motors, pole changing motors, Totally Enclosed Non Ventilated (TENV) motors, Servo motors		Excluded		
¹ Including: Brake motors; motors for explosive atmospheres Ex ec, Ex tb, Ex tc, Ex db and Ex dc; Motors rated for duty class: S1, S3 $\geq 80\%$, S6 $\geq 80\%$ and Totally Enclosed Air Over (TEAO) motors;				
² Exemption: ATEX motors regarding 2014/34/EU (for explosive atmospheres), Brake Motors				
Variable Speed Drives ≥ 100V and ≤ 1 000V				
$\geq 0,12 \dots \leq 1$ 000 kW		-	IE2 ³	
Regenerative drives		-	Excluded	
Low harmonic drives (THD < 10%)		-	Excluded	
1-phase drives		-	Excluded	
AC drives with multiple AC outputs		-	Excluded	
High voltage drives; Direct current drives		-	Excluded	
³ IE classification similar to IEC 61800-9-2				

Table 6 timelines

3. Questions and Answers

The intention of this chapter is to anticipate some frequently asked questions regarding the new Ecodesign Regulation (EU) 2019/1781 for motors and drives. It should be noted that these are offered without prejudice as guidance only. In case of conflict between this guide and the regulation, the regulation (EU) 2019/1781 takes precedence.

In the interests of clarity, the questions and answers are divided into four subject areas:

- (1) Scope of the Regulation
- (2) Exemptions
- (3) Installation & Environment
- (4) Miscellaneous

References to regulation (EU) 2019/1781

In some answers, the point to regulation is dropped, to get a better and easier wording.

References to required documentation in regulation (EU) 2019/1781

In some answers, there is a note to the required documentation. The regulation defines for motors and drives up to 12 items that must be provided to the market, for products in and outside of the scope.

3.1. Scope

No	Question	Answer
Q1.1	Which types of motor are affected?	<p>Until 30th June 2021</p> <ul style="list-style-type: none">○ Three-phase 50 Hz or 50/60 Hz induction motors; normal term: three-phase induction motors <p>From 1th July 2021 onwards</p> <ul style="list-style-type: none">○ Three-phase 50 Hz, 60 Hz or 50/60 Hz induction motors; normal term: three-phase induction motors <p>From 1th July 2023 onwards</p> <p>In addition to provisions that apply from 1th July 2021 onwards:</p> <ul style="list-style-type: none">○ Single-phase 50 Hz, 60 Hz or 50/60 Hz induction motors; normal term: AC motors, motor with a capacitor
Q1.2	What motor ratings are affected?	<p>The timeline differs depending on the motor ratings. (for details see Chapter 2.3 Timeline)</p>

No	Question	Answer
Q1.3	Are servo motors affected?	Servo motors which require a drive for operation and cannot be operated direct on-line are not covered by the scope of the regulation, neither regulation (EC) 640/2009, nor the new regulation (EU) 2019/1781.
Q1.4	Are reluctance motors/synchronous reluctance motors affected?	No. The regulation (EU) 2019/1781 only covers induction motors and no other technology.
Q1.5	Are High Voltage motors affected?	No. The regulation (EU) 2019/1781 does not cover motors above 1000 V.
Q1.6	Are DC motors affected?	No. Only single-phase and three-phase AC induction motors are covered by the regulation. Commutator motors are not covered.
Q1.7	Are electronic commutation motors (EC motors) affected?	No. The regulation only covers single-phase and three-phase AC induction motors. Motors with electronic commutation are not covered.
Q1.8	Are brake motors affected?	<p>Until 30th June 2021</p> <ul style="list-style-type: none"> ○ All brake motors are exempted. <p>From 1st July 2021 onwards</p> <ul style="list-style-type: none"> ○ Brake motors so designed that the efficiency of the motor can be determined independently of the brake are no longer exempted.
Q1.9.	Are geared motors affected?	<p>Geared motors sharing a common gear housing with the motor and that cannot be separated to determine the efficiency of the motor alone are exempted from the efficiency requirements</p> <p>This exemption is given in regulation (EU) 2019/1781 Article 2 point (2) (a).</p>
Q1.10	What numbers of motor poles are covered by the regulation?	<p>Until 30th June 2021</p> <ul style="list-style-type: none"> ○ 2-pole, 4-pole, 6-pole <p>From 1st July 2021 onwards</p> <ul style="list-style-type: none"> ○ 2-pole, 4-pole, 6-pole and 8-pole <p>For further details see Chapter 2.3 Timeline</p> <p>(The approximate speed of the motor is determined by the number of poles and the frequency of the AC voltage supplied to the motor.)</p>

No	Question	Answer
Q.1.11	Is there a relaxation for motors that are covered by the regulation when they are operated with a drive?	<p>Until 30th June 2021</p> <ul style="list-style-type: none"> ○ If a motor affected by Regulation (EC) 640/2009 does not comply with IE3 but does comply with IE2, it can be sold, provided that it is equipped with a variable speed drive. This requirement must be marked on the motor (IE2+VSD). <p>From 1th July 2021 onwards</p> <ul style="list-style-type: none"> ○ The motor must comply with the appropriate efficiency requirements given in regulation (EU) 2019/1781. Motors are not excluded due to the use of a variable speed drive. <ul style="list-style-type: none"> - An inverter duty motor per IEC TS 60034-25 is exempt because it is not rated direct-on-line-operation.
Q1.12	Does my variable speed drive have to be marked with an IE-Class?	<p>Until 30th June 2021</p> <ul style="list-style-type: none"> ○ IE-Class Marking not required <p>From 1st July 2021 onwards</p> <ul style="list-style-type: none"> ○ Must be marked and comply with efficiency level of class IE2 when the following conditions are all met: <ul style="list-style-type: none"> ▪ Three-phase AC input ▪ Only one three-phase AC voltage output at the drive ▪ One three-phase motor at the drive output and effective motor rating as described in Chapter 2.3 Timeline ▪ A rated voltage of between 100 V and 1 000 V (AC) ○ Certain VSDs listed in Article 2(3) of regulation (EU) 2019/1781 are exempted from most of the requirements of the regulation, including the efficiency requirement. See Q2.17, Q2.18, Q2.19 and Q2.20.
Q1.13	What does IE2 for a variable speed drive (VSD) mean?	The VSD must meet IE2 efficiency level. This means that the power losses at 90% rated motor stator frequency and 100% rated torque-producing current must be at least 25% below the values of Table 6 of Annex I of regulation (EU) 2019/1781. (This table is headed: Reference VSD losses and test load displacement factor for the IE class determination of VSDs)
Q1.14	My manufacturer describes his drive as a servo drive. Does the servo drive also affected?	The IE-Class Minimum requirement IE2 must be complied with if the VSD is designed to be used with induction motors as well as with servo motors (see Q1.12). If the drive is not rated to operate with induction motors; marking is not required.

No	Question	Answer
Q1.15	My motor does not have a standard rated voltage such as 400 V. Instead, the rating plate states 335 V (for example). Is it also affected?	Yes. The regulation covers motors with rated voltages from 50 to 1 000 V.
Q1.16	My motor does not have a standard rated frequency such as 50 Hz. Instead, the rating plate states 65 Hz (for example). Is it also affected?	No. The regulation (EU) 2019/1781 covers motors with rated frequency (50 Hz, 60 Hz, 50/60Hz) only. In addition, there can be no IE-class marking on the rating plate (according to regulation / IEC 60034-30-1).
Q1.17	Do differences exist between single-phase motors according to their starting and/or running capacitors?	No. The regulation makes no distinction between types of single-phase motors according to the number, function and size of the capacitors. All types must be at least IE2; even motors without capacitors must be IE2. (See also Q1.1).
Q1.18	My motor has a non-standard power rating. What do I do now?	If a motor's rating differs from the standard values the required minimum energy efficiency value must be calculated by interpolation. Reference of regulation (EU) 2019/1781: for 50 Hz motors, by interpolation with use of the coefficients (A/B/C/D) of Table 4 in Annex I for ratings between 0,12 and 0,55 kW and those of Table 5 in Annex I for ratings between 0,75 and 200 kW. Linear interpolation is performed for ratings between 0,55 and 0,75 kW.
Q1.19	Are hybrids such as LSPM (line start permanent magnet) motors, which still have a squirrel cage as well as permanent magnets, covered by the regulation?	No. The regulation covers only induction motors. No other technology is covered.

No	Question	Answer
Q1.20	Are motors intended for standstill operation on-line covered by the regulation?	<p>No, these motors are not sold with a power rating. These only have a torque rating at 0 min⁻¹</p> <p>The absence of a rated output power on the rating plate does not, of itself, exclude the motor from the regulation. However, certain motors of this type are excluded from this regulation. For example:</p> <ul style="list-style-type: none"> ○ Some motors, known as “torque motors” are rated with a torque at zero speed only. If a motor is only rated at zero speed, the output power will be zero. ○ Some other torque motors have a high torque at zero speed and a limited duty cycle when rotating. If this motor does not have a “continuous duty operation” the motor is excluded <p>Reference to regulation (EU) 2019/1781: “Continuous duty” is defined by Article 3(5),</p>
Q 1.21	What do the dates indicated in the Regulation correspond to?	<p>The dates indicated in the Ecodesign Regulation (EU) 2019/1781(for example 1st July 2021 or 1st July 2023 for electric motors) correspond to the date of first placing on the EU market.</p> <p>Motors are considered placed on the EU market if they have been transferred by the manufacturer or the importer to another economic operator in the EU (e.g. distributors, manufacturer’s sales company). before that date and they can then be resold, put into service and used after the deadlines of 1st July 2021 or 1st July 2023.</p> <p>For example, motors compliant to previous Regulation 640/2009 (EC) that have been placed on the EU market for the first time before 1st July 2021 can continue to be sold even after that deadline.</p> <p><i>See the “Blue Guide”, especially sections 2.2 and 2.3</i></p>
Q 1.22	How can I design an efficient motor system	Guidelines for designing an efficient motor system can be found in the standard IEC 61800-9-1 which is addressing the extended product approach.
Q 1.23	Are motor starters covered by the regulation?	No. Motor starters such as direct-on-line, star-delta and soft-starters are not included.
Q 1.24	Are so-called “marine motors” affected by the new regulation?	<p>Yes. If the power rating and number of poles are within the scope, then motors must comply with the regulation. Only motors designed specifically for the traction of electric vehicles are out of the scope.</p> <p>see Article 2 (2) (o), regulation (EU) 2019/1781</p>

No	Question	Answer
Q 1.25	Does the regulation address the system approach or any other load profile aspects?	No, the system approach is not addressed in the regulation The regulation (EU) 2019/1781 is particularly focusing on single components and not on their possible combinations in applications. However, there are requirements of providing energy efficiency data for motors and drives at different operating points.
Q 1.26	The nameplate of my motor states 87Hz. Is it affected?	If the nameplate states beside the 87 Hz also ratings which are covered by the regulation (50 Hz, 60 Hz, 50/60Hz) the answer is yes. Otherwise it's not included.

Table 7 Questions and Answers: Scope

3.2. Defined exemptions

No	Question	Answer
Q2.1	My motor is listed in the list of exempted motors in Article 2(2) of regulation (EU) 2019/1781. What does this mean?	<p>If the motor is one of the types listed in Article 2(2), then it is exempted from the efficiency requirements and most of the information requirements.</p> <p>However, if this exempted motor is in the scope of the regulation according to Article 2(1)(a), the motor will need to be CE marked according to the Ecodesign Directive 2009/125/EC and regulation (EU) 2019/1781.</p> <p>The following information will have to be displayed in the four places listed at the beginning of section 2 of Annex I of the regulation:</p> <p>(3) manufacturer's name or trademark, commercial registration number and address;</p> <p>(4) product's model identifier;</p> <p>(12) if the motor is considered exempt from efficiency requirement in accordance with Article 2(2) of this Regulation, the specific reason why it is considered exempt.</p>
Q2.2	My VSD is listed in the list of exempted VSDs in Article 2(3) of regulation (EU) 2019/1781. What does this mean?	<p>If the VSD is one of the types listed in Article 2(3), then it is exempted from the efficiency requirements and most of the information requirements.</p> <p>However, if this exempted VSD is in the scope of the regulation according to Article 2(1)(b), the VSD will need to be CE marked according to the Ecodesign Directive 2009/125/EC and regulation (EU) 2019/1781.</p> <p>The following information will have to be displayed in the four places listed at the beginning of section 4 of Annex I of the regulation:</p> <p>(3) manufacturer's name or trademark, commercial registration number and address;</p> <p>(4) product's model identifier;</p> <p>(11) if the VSD is considered exempt from the efficiency requirements in accordance with Article 2(3) of this regulation the specific reason why it is considered exempt.</p>
Q2.3	Are my non-ventilated motors exempted?	<p>Until 30th June 2021</p> <ul style="list-style-type: none"> ○ Motors in continuous duty operation without cooling systems are exempted from the regulation. <p>From 1st July 2021 onwards</p> <ul style="list-style-type: none"> ○ Only non-ventilated motors of the type TENV (totally enclosed non ventilated) are exempted. This exemption does not apply to other types of non-ventilated motor.

No	Question	Answer
Q2.4	Are motors affected which are cooled by an external (not included in the motor) fan?	<p>Until 30th June 2021</p> <ul style="list-style-type: none"> ○ All motors that are cooled by the airflow of the fan (TEAO, totally enclosed air over) are exempt, since this cooling method is not an integrated cooling system of the motor. <p>From 1st July 2021 onwards</p> <ul style="list-style-type: none"> ○ All motors in the scope of the regulation that are cooled by the airflow of an external fan (TEAO, totally enclosed air over) must meet the requirements. (see chapter 2.3. timeline)
Q2.5	How are explosion-protected motors affected?	<p>Until 30th June 2021</p> <ul style="list-style-type: none"> ○ The efficiency requirements do not apply to any motor covered by the ATEX Directive 2014/34/EU. <p>From 1st July 2021 onwards</p> <ul style="list-style-type: none"> ○ Motors for potentially explosive atmospheres: <ul style="list-style-type: none"> - flame-proof motors (Ex db / Zone 1, Ex dc / Zone 2) - increased safety motors (Ex ec / Zone 2) - motors with dust ignition protection (Ex tb / Zone 21, Ex tc / Zone 22) <p>covered by the ATEX Directive 2014/34/EU with the following specifications are affected:</p> <ul style="list-style-type: none"> - Three-phase $\geq 0,12$ kW and $< 0,75$ kW: at least IE2 - Three-phase $\geq 0,75$ kW and $\leq 1\ 000$ kW: at least IE3 <p>From 1st July 2023 onwards</p> <p>In addition to the rules applicable from 1 July 2021 onwards:</p> <ul style="list-style-type: none"> ○ Motors for potentially explosive atmospheres: <ul style="list-style-type: none"> - Increased safety motors (Ex eb / Zone 1) covered by the ATEX Directive 2014/34/EU with the following specifications are affected: <ul style="list-style-type: none"> Three-phase $\geq 0,12$ kW and $\leq 1\ 000$ kW: at least IE2 <p>Reference to Regulation (EC) 640/2009:</p> <ul style="list-style-type: none"> ○ Article 1(2) states that the regulation does not apply to certain motors except as regards some of the information requirements of Annex I. <p>Reference to Ecodesign Regulation (EU) 2019/1781:</p> <ul style="list-style-type: none"> ○ the timeline for Ex eb motors is given in point 1(b)(i) of Annex I; ○ the timeline for other explosion-protected motors is given in points 1(a) of Annex I and they are exempted from IE4 efficiency level by point 1(b)(ii).
Q2.6	My motor is liquid-cooled. What do I need to consider?	<p>The temperature at the inlet to the motor determines whether or not the Ecodesign Regulation/electric motors applies to the motor. Motors specifically designed for cooling media below 0 °C or over +32 °C are not affected. Otherwise, they must satisfy the requirements.</p>

No	Question	Answer
Q2.7	My motors are used in periodic duty, not in continuous duty. Does the regulation still apply?	When a motor is rated for other duty types and is also marked as such but may nevertheless be operated at rated power in continuous duty the regulation applies. Reference to regulation (EU) 2019/1781: 'continuous duty' is defined by Article 3(5), then see Article 2(1)(a)(iv)
Q2.8	My motors are completely immersed in a liquid. Does the regulation apply?	Motors specifically designed and specified to operate wholly immersed in a liquid are exempted from the efficiency requirements. Reference to regulation (EU) 2019/1781: Article 2(2)(e)
Q2.9	I manufacture motors with a large number of poles. What do I need to do?	The regulation does not apply to motors with 10 or more poles.
Q2.10	My motors have two or more stated speeds for one frequency. Does the regulation still apply?	Yes. The regulation applies, but various types of motor that have more than one rated speed for the same supply frequency are exempted from the efficiency requirements. Reference to regulation (EU) 2019/1781: Article 2(2)(n) exempts the following type of motor from the efficiency requirements: (n) multi-speed motors, i.e. motors with multiple windings or with a switchable winding, providing a different number of poles and speeds.
Q2.11	My motors have two or more stated speeds for one frequency, but only not in a pole changing design of the motor. Does the regulation still apply?	If a motor achieves multiple speeds for the one supply frequency via brushes, commutators, slip rings or electrical connections to the rotor, it is excluded from the regulation. Examples such as 2/4 pole motors Reference to regulation (EU) 2019/1781: <ul style="list-style-type: none"> ○ Article 2(1)(a) only includes induction motors "without brushes, commutators, slip rings or electrical connections to the rotor" into the scope of the regulation. Therefore, these motors are excluded. ○ Article 2(2)(k) exempts "motors with mechanical commutators" from the efficiency requirements.
Q2.12	My motor shares a housing with a variable speed drive. Before now, the regulation did not apply to this type of motor. Will this still be the case in the future?	The regulation does not apply, to motors with an integrated variable speed drive (compact drives) whose energy performance cannot be tested independently of the variable speed drive.

No	Question	Answer
Q2.13	I use motors in nuclear engineering. What do I need to consider in the future?	<p>If a motor is specifically qualified for the safety of nuclear installations, it is exempted from the efficiency requirements of the regulation.</p> <p>Reference to regulation (EU) 2019/1781:</p> <ul style="list-style-type: none"> ○ Article 2(2)(f) exempts motors specifically qualified for the safety of nuclear installations from the efficiency requirements ○ Article 2(2)(f) refers to Article 3 of Council Directive 2009/71/Euratom, which defines 'nuclear safety'. <p>Reference to required documents:</p> <ul style="list-style-type: none"> ○ Even when these motors are exempted, the information required by points (3), (4) and (12) of section 2 of Annex I must be published.
Q2.14	I use cordless or battery-operated motors. Do I need to consider anything?	No. The regulation does not apply to motors in cordless or battery-operated equipment like e.g. driverless transport systems.
Q2.15	Are the motors in tools such as drills, grinders, saws, etc. affected?	No, the regulation does not apply to motors in hand-held equipment whose weight is supported by hand during operation.
Q2.16	Does the regulation apply to motors for electric vehicles?	The regulation does not apply to motors designed specifically for the traction of electric vehicles.
Q2.17	My motor shares a housing with variable speed drive. Which IE-class must be shown?	If parts of the product (VSD or motor) can be tested individually their class must be stated on the product.
Q2.18	I use variable speed drives in nuclear engineering. What do I need to consider in the future?	<p>If a VSD is specifically qualified for the safety of nuclear installations, it is exempted from the efficiency requirements of the regulation.</p> <p>Reference to regulation (EU) 2019/1781:</p> <ul style="list-style-type: none"> ○ Article 2(3)(b) exempts VSDs specifically qualified for the safety of nuclear installations from the efficiency requirements ○ Article 2(3)(b) refers to Article 3 of Council Directive 2009/71/Euratom, which defines 'nuclear safety'.
Q2.19	My variable speed drive is a regenerative drive. Do I need to do anything?	<p>Regenerative drives are exempted from the requirement to publish the efficiency or losses; Article 2 (3) (c)</p> <p>Reference to required documents: Even when these drives are exempted, the information required by points (3), (4) and (11) of section 4 of Annex I must be published</p>

No	Question	Answer
Q2.20	The variable speed drive that I use does not have a simple input rectifier. Instead, it controls the input variables so that sinusoidal current flows to the system. Is marking required?	<p>Drives with sinusoidal input current are exempted from the requirement to meet a particular efficiency level and from the requirement to publish the efficiency (or losses). Simple variable speed drives with a six-pulse bridge connection in the input generate a pulsating current on the grid side and these drives are not exempted from the regulation; Article 2 (3) (d)</p> <p><u>Reference to required documents:</u> Even when drives are exempted, the information required by points (3), (4) and (11) of section 4 of Annex I must be published</p>
Q2.21	The motor is integrated into the machine/installation in a way that prevents it from being separated in order to be tested. Before now, the regulation did not apply in this case. Will this still be the case in the future?	<p>Yes. When the motor cannot be separated, the requirements for demonstration of the energy efficiency do not apply.</p> <p>Motor is of integrated type if all the bullet points apply:</p> <ul style="list-style-type: none"> • Whose energy performance cannot be tested independently from the product, even with the provision of a temporary end-shield and drive-end bearing; • The motor must share common components (apart from connectors such as bolts) with the driven unit (for example, a shaft or housing); • Shall not be designed in such a way that the motor can be separated in its entirety from the driven unit and operate independently; • The process of separation shall have the consequence of rendering the motor inoperative.
Q2.22	The rating plate of my motor does not state the power, only torque values. This means that the regulation does not apply to the motor, am I right?	<p>The absence of a rated output power on the rating plate does not, of itself, exclude the motor from the regulation. However, certain motors of this type are excluded from this regulation. For example:</p> <ul style="list-style-type: none"> ○ Some motors, known as “torque motors” are rated with a torque at zero speed only. If a motor is only rated at zero speed, the output power will be zero. ○ Some other torque motors have a high torque at zero speed and a limited duty cycle when rotating. If this motor does not have a “continuous duty operation” the motor is excluded <p>Reference of regulation (EU) 2019/1781: output power is less than 0,12 kW see Article 2(1)(a)(iii), “cd” as defined by Article 3(5) of the regulation then see Article 2(1)(a)(iv).</p>

Table 8 Questions and Answers: Defined exemptions

3.3. Ambient conditions

No	Question	Answer
Q3.1	My motors are intended for warm/hot ambient temperatures. Are they affected?	<ul style="list-style-type: none"> ○ On motors marked with a temperature range (min. ... max.), both the minimum and the maximum must be greater than +60 °C in order for the motor to be exempt from the efficiency requirements. For example: +65 °C ... +95°C ○ On motors marked with only one temperature value, this temperature must be greater than +60 °C in order to be exempt from the efficiency requirements. For example: +65 °C
Q3.2	My motors are intended for use in cold stores. Are they affected?	<ul style="list-style-type: none"> ○ On motors marked with a temperature range (min. ... max.), both the minimum and the maximum must be lower than -30 °C in order for the motor to be exempt from the efficiency requirements. For example: -55 °C ... -35 °C ○ On motors marked with only one temperature value, this temperature must be lower than -30 °C in order for the motor to be exempt from the efficiency requirements. For example: -40°C
Q3.3	How must the elevation of installation be considered?	<p>Until 30th June 2021 and From 1st July 2021 onwards</p> <ul style="list-style-type: none"> ○ The efficiency requirements apply not for motors, which specifically designed and specified to operate exclusively at altitudes exceeding 4 000 meters above sea-level. For elevations below this, the requirements must be met; at higher elevations, motors are exempted from the efficiency requirements. <p>Drives: There is no exemption regarding elevation.</p> <p><u>Reference to required documents:</u> Even when motors above 4 000m are exempted, the information required by points (3), (4) and (12) of section 2 of Annex I must be published.</p>
Q3.4	My motors have a maximum operating temperature of 300 °C or 400 °C. Are they covered by the regulation?	Yes. Only motors specifically designed and specified to operate exclusively with a maximum operating temperature above 400 °C are exempt from the efficiency requirements; for lower maximum operating temperatures, the efficiency requirements apply.
Q3.5	My motor is designed for extremely high atmospheric humidity. Is it exempted from the regulation?	No. Resistance to atmospheric humidity does not result in exemption from the regulation (EU) 2019/1781.
Q3.6	My motor is operated in a chamber with a substantially reduced atmospheric pressure, but not in a vacuum. Is it exempted from the regulation?	No. Use at low atmospheric pressure alone does not result in an exemption. The motor may however be designed exclusively for these specific conditions and be sold in this form only to you. If this is the case, the answer to Q4.3 applies.

Table 9 Questions and Answers: Ambient conditions

3.4. Miscellaneous

No	Question	Answer
Q4.1	My manufacturer is not allowed to supply me with a substitute motor when a motor develops a fault. Has anything changed in this respect?	<p>Until 30th June 2021</p> <ul style="list-style-type: none"> ○ Only motors that are in use may be repaired. <p>From 1st July 2021 onwards</p> <p>Until 30 June 2029</p> <ul style="list-style-type: none"> ○ In addition to the repair of motors in use, identical replacement motors may be supplied if the original motors were placed on the market before 1 July 2022. These motors must be specifically marketed as such. A statement that the motor may only be used as a replacement part must be applied to the motor and packaging and included in the documentation. <p>Reference of regulation (EU) 2019/1781: Article 2 (2) (m) + Information requirements in annex I (2)</p>
Q4.2	My supplier has his own documentation for the product according to Ecodesign Regulation (EC) 640/2009. Will this requirement exist in Ecodesign Regulation (EU) 2019/1781?	<p>Yes, this form of documentation will continue to exist. It has been extended to cover 13 elements. When motors are not covered by the regulation, this fact must also be documented, together with the reason why the regulation does not apply to the motor.</p> <p>Variable speed drives must also be documented similarly, with 11 elements.</p> <p>The documentation for motors and variable speed drives is provided by the manufacturer, the importer or the authorized representative (e.g. Dealer).</p>
Q4.3	Do certain degrees of ingress protection or protection of enclosures result in exemption from the regulation?	<p>No. The regulation (EU) 2019/1781 does not contain any arrangements for exemption owing to a degree of ingress protection or protection of enclosures.</p> <p>Likewise, the terms "open" or "fully enclosed" commonly used in the US are not a distinguishing characteristic in the EU, and both of these motor types must meet the requirements.</p>
Q4.4	When is a CE mark applied to the motor, and when not?	<p>A CE mark means that the product meets all applicable EU legislation. It may be applied to motors only when the manufacturer has completed the necessary conformity procedure in accordance with all(!) applicable EU Directives and Regulations and is able to prove that this has taken place.</p> <p>Ask for manufacturers Declaration of Conformity for details to ensure right interpretation".</p>
Q4.5	How can I check whether the drive satisfies the rules currently in force?	<p>The first check is whether the CE mark is present and check the information in the EU declaration of conformity is up to date and states the current directives and regulations. Secondly: Are the energy efficiency values stated on the rating plate consistent with the required values in the table in the regulation?</p> <p>Regarding the information see Q 4.6 and Q 4.7</p>

No	Question	Answer
Q4.6	How can I check/measure the information stated by my motor supplier?	<p>The regulation (EU) 2019/1781 states in (1) of Annex II that the summation of losses method must be used for three-phase motors and the direct measurement method for single-phase motors. Both methods are described in IEC 60034-2-1. This is followed by calculation and determining of the total losses and classification.</p> <p>Determination of losses in the 7 load points shall be done by measurements or calculations according standards or other reliable, accurate and reproducible methods. For the purpose of verification of compliance only measurements shall be used, e.g. input/output method.</p>
Q4.7	How can I check/measure the information stated by my variable speed drive supplier?	<p>The article (2) in Annex II of the regulation states that three permissible methods are available to the manufacturer for determining the losses:</p> <ul style="list-style-type: none"> ○ Direct method ○ Calorimetric method ○ Single loss determination method <p>Note: Controlling the efficiency in the field will be difficult as the defined load conditions must be met and the measurement devices must have a certain accuracy.</p>
Q4.8	My motor supplier offers different variants of the same motor type. On which variant is the energy Efficiency determined?	<p>When auxiliary equipment is used that does not form an integral part of the basic motor design, such as shaft seals, external fans, mechanical brakes, reverse running stops, unidirectional bearings, rotary encoders, tachogenerators, etc., the energy efficiency is determined in accordance with the standard on the basic motor with original cooling, without the auxiliary equipment fitted.</p> <p>The above paragraph also applies to drives fitted to the motors.</p>
Q4.9	What about enforcement?	<p>Member States are responsible for checking that products placed on the EU market do comply with all applicable product legislation, including eco design. In each Member State, appointed market surveillance authority (MSA) is in charge of this.</p>
Q4.10	What about tolerances of efficiency values?	<p>The efficiency value must be guaranteed by the manufacturers. Using the tolerances is only allowed by market surveillance to assess the test results and determine compliance or not.</p>

Table 10 Questions and Answers: Miscellaneous

4. Worldwide efficiency regulations for Motors and Drives

4.1 Motors

The following table shows an overview of several countries (in alphabetic order) with efficiency regulations for motors and if and how the efficiency marking is to be done.

Country	IE	Phases kW	No. of poles	From	To	Key exceptions	Efficiency: Certificate or registration or ...	Efficiency: Logo or sticker or ...	
Argentina	1	1~: 0,12...7,5	2, 4, 6, 8	21 Dec. 2017		Installed motors All non-S1 motors Converter motors (IEC 60034-25)	Certificate	Sticker	
	1	3~: 0,75...30	2, 4, 6, 8				Installed motors Converter motors (IEC 60034-25)	Certificate	Sticker
Australia	2	3~: 0,73...185	2, 4, 6, 8	10 July 2019		S2 motors Converter motors Integral Gear motors	Only product registration by type designation	Neither Logo nor sticker	
Brazil	3	3~: 0,12...370	2, 4, 6, 8	1 Sep. 2019		All non S1, all Non S3<80%	product registration by type designation and location of manufacturing	Logo + No.	
Canada	3	3~: 0,75...185	8	28 June 2017		All non-S1 motors Converter motors	Certificate	Logo	
	3	3~: 0,75...260	6				Certificate	Logo	
	3	3~: 0,75...375	2, 4				Certificate	Logo	
China	2	3~: 0,75...375	2, 4, 6	1 Oct. 2016 ¹⁾	31 May 2021	All non-S1 motors Converter motors Non-ventilated motors Special motors for specific machine requirements	product registration by type designation and location of manufacturing + Certificate	Sticker with QR-Code	
	3 ²⁾	3~: 0,12...1000	2, 4, 6, 8	1 June 2021		All non-S1 motors Non-ventilated motors Special motors for specific machine requirements	product registration by type designation and location of manufacturing + Certificate	Sticker with QR-Code	
	# ³⁾	1~: 0,12...3,7 0,12...2,2	2, 4, 6 2, 4, 6						with starting cap. with running cap.
	1 ³⁾	1~: 0,25...3,7	2, 4						with st.+run. cap.

¹⁾ China introduced the GB18613 at September 1st, 2012, updated it to October 1st 2016 with new stickers including a QR-code,

²⁾ updated again May 29, 2020 with in force to June 1, 2021 with new grade system

³⁾ own table for 1~motors with starting or running capacitor unequal to IE-classes from IEC 60034-30-1, but for 1~motors with parallel starting and running capacitor the table are equal to IE-classes from IEC 60034-30-1

Country	IE	Phases kW	No. of poles	From	To	Key exceptions	Efficiency: Certificate or registration or ...	Efficiency: Logo or sticker or ...
Chile	1	3~: 0,75...375	2, 4, 6	1 Jan. 2011		All non-S1 motors Converter motors Brake motors	Certificate	Sticker
Columbia	2	3~: 0,18...7,49	2, 4, 6, 8	31 Aug. 2018			Certificate	Sticker
	2	3~: 7,5...373	2, 4, 6, 8	31 Aug. 2018	30 Aug. 2020		Certificate	Sticker
	3	3~: 7,5...373	2, 4, 6, 8	31 Aug. 2020			Certificate	Sticker
EU	2+ VSD or 3	3~: 0.75...375	2, 4, 6	1 Jan 2017	30 Jun 2021	Integral products Brake motor explosive atmospheres	producer self declaration	Logo (CE-mark)
	2	1~: 0,12...	2, 4, 6, 8	1 Jul 2023		TENV non S1, S3<80%, S6 <80% above +60°C below -30°C	producer self declaration	Logo (CE-mark)
	2	3~: 0,12...<0,75	2, 4, 6, 8	1 Jul 2021			producer self declaration	Logo (CE-mark)
	3	3~: 0,75...<75	2, 4, 6, 8	1 Jul 2021			producer self declaration	Logo (CE-mark)
	3	3~: 75...200	2, 4, 6, 8	1 Jul 2021	30 June 2023		producer self declaration	Logo (CE-mark)
	3	3~: >200...1 000	2, 4, 6, 8	1 Jul 2021			producer self declaration	Logo (CE-mark)
	4	3~: 75...200	2, 4, 6	1 Jul 2023		Brake motor explosive atmospheres	producer self declaration	Logo (CE-mark)
Ecuador	2	3~: 0,75...375	2, 4, 6, 8	23 Nov. 2018			Certificate	Sticker
EAEU ⁴⁾	2	3~: 0,75 – 375	2, 4, 6	1 Sep 2021	31 Aug. 2023	Integral products Brake motor, above 4000m above +60°C below -30°C below 0°C watercooled explosive atmospheres	Certificate	Logo
	2	3~: 0,75...7,49	2, 4, 6	1 Sep 2023	31 Aug. 2025		Certificate	Logo
	2+ VSD or 3	3~: 7,5...375	2, 4, 6	1 Sep 2023	31 Aug. 2025		Certificate	Logo
	2+ VSD or 3	3~: 0,75... 375	2, 4, 6	1 Sep 2025			Certificate	Logo

⁴⁾ Eurasian Economic Union (EAEU): Armenia, Belarus, Kazakhstan, Kyrgyzstan, Russia

Country	IE	Phases kW	No. of poles	From	To	Key exceptions	Efficiency: Certificate or registration or ...	Efficiency: Logo or sticker or ...
India	2	3~: 0,12...1000	2, 4, 6, 8	4 Feb. 2019		All non S1 motors redirected to S1	product registration and certificate by type designation and location of manufacturing	Logo
Japan	3	3~: 0,75...375	2, 4, 6	1 April 2015		All non-S1 motors Converter motors Ex motors	Only product registration by type designation	Neither Logo nor sticker
Mexico	3	3~: 0,75...375	2, 4, 6, 8	19 Dec. 2010		All non-S1 motors Geared motors	product registration by type designation and location of manufacturing	Logo + No.
New Zealand	2	3~: 0,73...185	2, 4, 6, 8	10 July 2019		S2 motors Converter motors Integral Gear motors	Only product registration by type designation	Neither Logo nor sticker
Peru	3(=A) 2(=B) 1(=C)	3~: 0,75...375	IEC: 2,4,6 NEMA. 2,4,6,8	3 Dec. 2019		[no minimum efficiency is defined, but marking is required]	Certificate	Sticker
Saudi Arabia	3	3~: 0,75...375	2, 4, 6	1 Jan. 2017		Brake motors explosive atmospheres	product registration by type designation and location of manufacturing	Neither Logo nor sticker
Singapore	3	3~: 0,75...375	2, 4, 6	1 Oct 2018		Non S1, S3>80%, S6, S9	Only product registration by type designation	Neither Logo nor sticker
South Korea	3	3~: 0,75...375 3~: 0,75...200	4, 6 2,8	1 Oct. 2018		S2 motors Converter motors Non-ventilated motors	product registration by type designation and location of manufacturing	Sticker
Switzerland	3	3~: 0,75...375	2, 4, 6	1 Jan. 2017		Equal to EU	producer self declaration	Logo (CE-mark)
Taiwan	3	3~: 0,75...200	2, 4, 6, 8	1 Jul 2016			Certificate (?)	Sticker (?)
Turkey	3	3~: 0,75...375	2, 4, 6	1 Jan. 2017		Equal to EU	producer self declaration	Logo (CE-mark)

Country	IE	Phases kW	No. of poles	From	To	Key exceptions	Efficiency: Certificate or registration or ...	Efficiency: Logo or sticker or ...
Ukraine	-	-			14 Sep. 2021	-	-	-
	2+ VSD or 3	3~: 0,75...375	2, 4, 6	15 Sep. 2021		Integral products Brake motors explosive atmospheres	Certificate	Logo
USA	3	3~: 0,75...185	8	1 June 2016		All non-S1 motors Converter motors	Certificate	Logo
	3	3~: 0,75...260	6	1 June 2016			Certificate	Logo
	3	3~: 0,75...375	2, 4	1 June 2016			Certificate	Logo

Table 11 Worldwide efficiency regulations for Motors

4.2 Worldwide regulations permanent magnet Motors

The following table shows an overview of those countries (in alphabetic order) with efficiency regulations for permanent magnet synchron motors and if and how the efficiency marking is to be done.

Country	IE	Phases kW	Speed rpm	From	To	Key exceptions	Efficiency: Certificate or registration or ...	Efficiency: Logo or sticker or ...
China	-	-	-	-	30 June 2020	-	-	-
	# 4)	3~: 0,55...90	500 ... 3.000	1 July 2020		nominal speed > 3.000 rpm	product registration by type designation and location of manufacturing + Certificate	Sticker with QR-Code

Table 12 Worldwide efficiency regulations for PM Motors

4) own value required, Grade 3 – Grade 1, different in comprehension to IEC TS 60034-30-2

4.3 Worldwide regulations line start permanent magnet Motors

The following table shows an overview of those countries (in alphabetic order) with efficiency regulations for line start permanent magnet synchron motors and if and how the efficiency marking is to be done.

Country	IE	Phases kW	No. of poles	From	To	Key exceptions	Efficiency: Certificate or registration or ...	Efficiency: Logo or sticker or ...
China	-	-	-	-	30 June 2020	-	-	-
	2 ⁵⁾	3~: 0,55...375	2, 4, 6, 8, 10, 12, 16	1 July 2020		< 0,55 kW Un > 1.140 V	product registration by type designation and location of manufacturing + Certificate	Sticker with QR-Code

Table 13 Worldwide efficiency regulations for LS PM Motors

5) Grade 3 (=IE2), Grade2 (=IE3), Grade 1 (=IE4), small differences in comprehension to IEC 60034-30-2

4.4 Worldwide regulations permanent magnet for elevators

The following table shows an overview of those countries (in alphabetic order) with efficiency regulations of permanent magnet synchron motors for elevators and if and how the efficiency marking is to be done.

Country	IE	Phases kW	Speed	From	To	Key exceptions	Efficiency: Certificate or registration or ...	Efficiency: Logo or sticker or ...
China	-	-	-	-	30 June 2020	-	-	-
	# ⁶⁾	3~:	<=100 >100 >140 >180 >250 >400 >750	1 July 2020			product registration by type designation and location of manufacturing + Certificate	Sticker with QR-Code

Table 14 Worldwide efficiency regulations for elevator PM Motors

6) own value required, Grade 3 – Grade 1, different in comprehension to IEC TS 60034-30-2

4.5 Worldwide regulations Drives

The following table shows an overview of those countries (in alphabetic order) with efficiency regulations for drives and if and how the efficiency marking is to be done.

Country	IE	Phases kW	f _{max} Hz	From	To	Key exceptions	Efficiency: Certificate or registration or ...	Efficiency: Logo or sticker or ...
EU	2	3~: 0,12...1 000	599	1 Jul 2021		Multi axis Active front end	producer self declaration	Logo (CE-mark)

Table 15 Worldwide efficiency regulations for Drives

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