GLOBAL MEPS

Electric motors have a significant impact on the worldwide energy consumption, accounting up to 50% of global energy consumption, and over in industrial application. Today in fact, the major factor influencing the motor industry is energy efficiency, driven by both increasingly demanding legislation and industry's greater awareness of green issue responsibilities.

Many Governments worldwide have imposed local Regulations, defining Minimum Energy Performance Standards (MEPS) to several types of electrical equipment, including electric motors. And the scope of these Regulations become even more stringent year by year. Regional standards, defining the efficiency levels and test methods to determine efficiencies, allow a standardization in the definition and measurement of efficiency amongst motor manufacturers, so simplifying the motors' selection.

Lafert embraces the challenge, offering a wide range of high efficiency motors in compliance with these minimum efficiency levels, whilst remaining committed to the research and development of innovative solutions with even higher efficiency levels.

INTERNATIONAL EFFICIENCY LEVELS: IE CODES

The International Standard **IEC 60034-30-1;2014** ensures a common base for electric motor designing and classification, as well as for national legislative activities, increasing the level of harmonization in **MEPS** (Minimum Energy Performance Standard) all over the world.

The IEC 60034-30-1 states the efficiency levels (IE codes) and requirements and provides test conditions and efficiency measurement methods specified in **IEC 60034-2-1;2014**. It doesn't state the minimum efficiency level (MEPS). This depends on any national legislative activities and government targets to save energy.

IE1	IE2	IE3	IE4
Standard Efficiency	High Efficiency	Premium Efficiency	Super-Premium Efficiency

EFFICIENCY VALUES FOR 50 HZ ACCORDING TO IEC 60034-30-1:2014

Output	IE1				IE2				IE3				IE4			
kW	2	4	6	8	2	4	6	8	2	4	6	8	2	4	6	8
0.12	45.0	50.0	38.3	31.0	53.6	59.1	50.6	39.8	60.8	64.8	57.7	50.7	66.5	69.8	64.9	62.3
0.18	52.8	57.0	45.5	38.0	60.4	64.7	56.6	45.9	65.9	69.9	63.9	58.7	70.8	74.7	70.1	67.2
0.20	54.6	58.5	47.6	39.7	61.9	65.9	58.2	47.4	67.2	71.1	65.4	60.6	71.9	75.8	71.4	68.4
0.25	58.2	61.5	52.1	43.4	64.8	68.5	61.6	50.6	69.7	73.5	68.6	64.1	74.3	77.9	74.1	70.8
0.37	63.9	66.0	59.7	49.7	69.5	72.7	67.6	56.1	73.8	77.3	73.5	69.3	78.1	81.1	78.0	74.3
0.40	64.9	66.8	61.1	50.9	70.4	73.5	68.8	57.2	74.6	78.0	74.4	70.1	78.9	81.7	78.7	74.9
0.55	69.0	70.0	65.8	56.1	74.1	77.1	73.1	61.7	77.8	80.8	77.2	73.0	81.5	83.9	80.9	77.0
0.75	72.1	72.1	70.0	61.2	77.4	79.6	75.9	66.2	80.7	82.5	78.9	75.0	83.5	85.7	82.7	78.4
1.1	75.0	75.0	72.9	66.5	79.6	81.4	78.1	70.8	82.7	84.1	81.0	77.7	85.2	87.2	84.5	80.8
1.5	77.2	77.2	75.2	70.2	81.3	82.8	79.8	74.1	84.2	85.3	82.5	79.7	86.5	88.2	85.9	82.6
2.2	79.7	79.7	77.7	74.2	83.2	84.3	81.8	77.6	85.9	86.7	84.3	81.9	88.0	89.5	87.4	84.5
3	81.5	81.5	79.7	77.0	84.6	85.5	83.3	80.0	87.1	87.7	85.6	83.5	89.1	90.4	88.6	85.9
4	83.1	83.1	81.4	79.2	85.8	86.6	84.6	81.9	88.1	88.6	86.8	84.8	90.0	91.1	89.5	87.1
5.5	84.7	84.7	83.1	81.4	87.0	87.7	86.0	83.8	89.2	89.6	88.0	86.2	90.9	91.9	90.5	88.3
7.5	86.0	86.0	84.7	83.1	88.1	88.7	87.2	85.3	90.1	90.4	89.1	87.3	91.7	92.6	91.3	89.3
11	87.6	87.6	86.4	85.0	89.4	89.8	88.7	86.9	91.2	91.4	90.3	88.6	92.6	93.3	92.3	90.4
15	88.7	88.7	87.7	86.2	90.3	90.6	89.7	88.0	91.9	92.1	91.2	89.6	93.3	93.9	92.9	91.2
18.5	89.3	89.3	88.6	86.9	90.9	91.2	90.4	88.6	92.4	92.6	91.7	90.1	93.7	94.2	93.4	91.7
22	89.9	89.9	89.2	87.4	91.3	91.6	90.9	89.1	92.7	93.0	92.2	90.6	94.0	94.5	93.7	92.1
30	90.7	90.7	90.2	88.3	92.0	92.3	91.7	89.8	93.3	93.6	92.9	91.3	94.5	94.9	94.2	92.7
37	91.2	91.2	90.8	88.8	92.5	92.7	92.2	90.3	93.7	93.9	93.3	91.8	94.8	95.2	94.5	93.1
45	91.7	91.7	91.4	89.2	92.9	93.1	92.7	90.7	94.0	94.2	93.7	92.2	95.0	95.4	94.8	93.4
55	92.1	92.1	91.9	89.7	93.2	93.5	93.1	91.0	94.3	94.6	94.1	92.5	95.3	95.7	95.1	93.7
75	92.7	92.7	92.6	90.3	93.8	94.0	93.7	91.6	94.7	95.0	94.6	93.1	95.6	96.0	95.4	94.2
90	93.0	93.0	92.9	90.7	94.1	94.2	94.0	91.9	95.0	95.2	94.9	93.4	95.8	96.1	95.6	94.4
110	93.3	93.3	93.3	91.1	94.3	94.5	94.3	92.3	95.2	95.4	95.1	93.7	96.0	96.3	95.8	94.7
132	93.5	93.5	93.5	91.5	94.6	94.7	94.6	92.6	95.4	95.6	95.4	94.0	96.2	96.4	96.0	94.9
160	93.7	93.8	93.8	91.5	94.8	94.9	94.8	93.0	95.6	95.8	95.6	94.3	96.3	96.6	96.2	95.1
200-1000	94.0	94.0	94.0	92.5	95.0	95.1	95.0	93.5	95.8	96.0	95.8	94.6	96.5	96.7	96.3	95.4

EFFICIENCY VALUES FOR 60 HZ ACCORDING TO IEC 60034-30-1:2014

Output	IE1				IE2				IE3				IE4			
kW	2	4	6	8	2	4	6	8	2	4	6	8	2	4	6	8
0.12	57.5	62.0	48.0	36.0	59.5	64.0	50.5	40.0	62.0	66.0	64.0	59.5	66.0	70.0	68.0	64.0
0.18	62.0	66.0	52.5	40.0	64.0	68.0	55.0	46.0	65.6	69.5	67.5	64.0	70.0	74.0	72.0	68.0
0.25	64.0	68.0	57.5	50.5	68.0	70.0	59.5	52.0	69.5	73.4	71.4	68.0	74.0	77.0	75.5	72.0
0.37	70.0	70.0	62.0	57.5	72.0	72.0	64.0	58.0	73.4	78.2	75.3	72.0	77.0	81.5	78.5	75.5
0.55	72.0	74.0	66.0	59.5	74.0	75.5	68.0	62.0	76.8	81.1	81.7	74.0	80.0	84.0	82.5	77.0
0.75	74.0	77.0	72.0	64.0	75.5	78.0	73.0	66.0	77.0	83.5	82.5	75.5	82.5	85.5	84.0	78.5
1.1	78.5	79.0	75.0	73.5	82.5	84.0	85.5	75.5	84.0	86.5	87.5	78.5	85.5	87.5	88.5	81.5
1.5	81.0	81.5	77.8	77.0	84.0	84.0	86.5	82.5	85.5	86.5	88.5	84.0	86.5	88.5	89.5	85.5
2.2	81.5	83.0	78.5	78.0	85.5	87.5	87.5	84.0	86.5	89.5	89.5	85.5	88.5	91.0	90.2	87.5
3.7	84.5	85.0	83.5	80.0	87.5	87.5	87.5	85.5	88.5	89.5	89.5	86.5	89.5	91.0	90.2	88.5
5.5	86.0	87.0	85.0	84.0	88.5	89.5	89.5	85.5	89.5	91.7	91.0	86.5	90.2	92.4	91.7	88.5
7.5	87.5	87.5	86.0	85.0	89.5	89.5	89.5	88.5	90.2	91.7	91.0	89.5	91.7	92.4	92.4	91.0
11	87.5	88.5	89.0	87.5	90.2	91.0	90.2	88.5	91.0	92.4	91.7	89.5	92.4	93.6	93.0	91.0
15	88.5	89.5	89.5	88.5	90.2	91.0	90.2	89.5	91.0	93.0	91.7	90.2	92.4	94.1	93.0	91.7
18.5	89.5	90.5	90.2	88.5	91.0	92.4	91.7	89.5	91.7	93.6	93.0	90.2	93.0	94.5	94.1	91.7
22	89.5	91.0	91.0	90.2	91.0	92.4	91.7	91.0	91.7	93.6	93.0	91.7	93.0	94.5	94.1	93.0
30	90.2	91.7	91.7	90.2	91.7	93.0	93.0	91.0	92.4	94.1	94.1	91.7	93.6	95.0	95.0	93.0
37	91.5	92.4	91.7	91.0	92.4	93.0	93.0	91.7	93.0	94.5	94.1	92.4	94.1	95.4	95.0	93.6
45	91.7	93.0	91.7	91.0	93.0	93.6	93.6	91.7	93.6	95.0	94.5	92.4	94.5	95.4	95.4	93.6
55	92.4	93.0	92.1	91.5	93.0	94.1	93.6	93.0	93.6	95.4	94.5	93.6	94.5	95.8	95.4	94.5
75	93.0	93.2	93.0	92.0	93.6	94.5	94.1	93.0	94.1	95.4	95.0	93.6	95.0	96.2	95.8	94.5
90	93.0	93.2	93.0	92.5	94.5	94.5	94.1	93.6	95.0	95.4	95.0	94.1	95.4	96.2	95.8	95.0
110	93.0	93.5	94.1	92.5	94.5	95.0	95.0	93.6	95.0	95.8	95.8	94.1	95.4	96.2	96.2	95.0
150	94.1	94.5	94.1	92.5	95.0	95.0	95.0	93.6	95.4	96.2	95.8	94.5	95.8	96.5	96.2	95.4
185	94.1	94.5	94.1	92.5	95.4	95.4	95.0	93.6	95.8	96.2	95.8	95.0	96.2	96.5	96.2	95.4
220 - 1000	94.1	94.5	94.1	92.5	95.4	95.4	95.0	93.6	95.8	96.2	95.8	95.0	96.2	96.8	96.5	95.4

GLOBALLY MINIMUM EFFICIENCY STANDARDS

Region	Country	Product range	Law / Regulation	MEPS
EUROPE	EUROPEAN UNION	400 V ± 10%; 50/60 Hz 0.12 - 1000 kW - 2-8 poles	UE 2019/1781 and AMENDMENT EU 2021/341 60034-30-1:2014	**IE3 motors from 0.75 to 1000 kW** **IE2 motors from 0.12 to 0.55 kW** compulsory 01.07.2021
	SWITZERLAND	400 V ± 10%; 50/60 Hz 0.12 - 1000 kW - 2-8 poles	UE 2019/1781 and AMENDMENT EU 2021/341 60034-30-1:2014	**IE3 motors from 0.75 to 1000 kW** **IE2 motors from 0.12 to 0.55 kW** compulsory 01.07.2021
	TURKEY	400 V ± 10%; 50/60 Hz 0.12 - 1000 kW - 2-8 poles	UE 2019/1781 and AMENDMENT EU 2021/341 60034-30-1:2014	**IE3 motors from 0.75 to 1000 kW** **IE2 motors from 0.12 to 0.55 kW** compulsory 01.07.2021
	UNITED KINGDOM	400 V ± 10%; 50/60 Hz 0.12 - 1000 kW - 2-8 poles	UE 2019/1781 and AMENDMENT EU 2021/341 60034-30-1:2014	**IE3 motors from 0.75 to 1000 kW** **IE2 motors from 0.12 to 0.55 kW** compulsory 01.07.2021
NORTH AMERICA	CANADA	480 V/575 V ± 10%; 60 Hz 1 - 500 HP - 2-8 poles	IEEE 112-2004 CSA C390-10	**IE3** compulsory 28.06.2017
	MEXICO	460 V ± 10%; 60 Hz 1 - 500 HP - 2-8 poles	NOM-016-ENER 2016 CSA C390-10	**IE3** compulsory 19.12.2010
	USA	480 V ± 10%; 60 Hz 1 - 500 HP - 2-8 poles	IEEE 112-2004 CSA C390-10	**IE3** compulsory 01.06.2016
SOUTH AMERICA	BRAZIL	220/380/440/460/480 V ± 10%; 60 Hz 0.12 - 370 kW - 2-8 poles	ABNT NBR 17094-1 Portaria n. 01/2017	**IE3** compulsory 01.09.2019
	CHILE	380/400/420/440/460/690 V ± 10%; 50 Hz 0.75 Kw - 7.5 kW - 2-6 poles	NCH 3086	**IE2** compulsory 04.01.2011
OCEANIA	AUSTRALIA NEW ZEALAND	415 V/690 V±10%; 50 Hz 0.73 - 185 kW - 2-8 poles	GEMS Act of 2019 IEC 60034-30-1	**IE2** compulsory 10.07.2019
ASIA	CHINA	380 V ± 10%; 50 Hz 0.12 - 1000 kW - 2-8 poles	GB 18613-2020 Decree n. 35	**IE3** compulsory 01.06.2021
	INDIA	415 V/690 V ± 10%; 50Hz 0.12 - 1000 kW - 2-8 poles	IS:12615	**IE2** compulsory 04.02.2019
	JAPAN	200/220/400/440 V ± 10%; 50/60 Hz 0.75 - 375 kW - 2-6 poles	JIS C 4034-30 Energy Saving Act	**IE3** compulsory 01.04.2015
	SOUTH KOREA	up to 600 V ±10%; 60Hz 0.75 - 375 kW - 2-8 poles	MKE-2017-206 KS C IEC 60034	**IE3** compulsory 01.01.2018
	SINGAPORE	415 V ± 10%; 50 Hz 0.75 - 375 kW - 2-6 poles	Energy Conservation Act IEC 60034-2-1	**IE3** compulsory 01.01.2018
	SAUDI ARABIA	380 V/ 400 V ± 5%; 60 Hz 0.75 - 375kW - 2-8 poles	SASO 2893	**IE3** compulsory 01.01.2017

EUROPE – ECODESIGN REGULATION EU 2019/1781 AND AMENDMENT EU 2021/341

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.

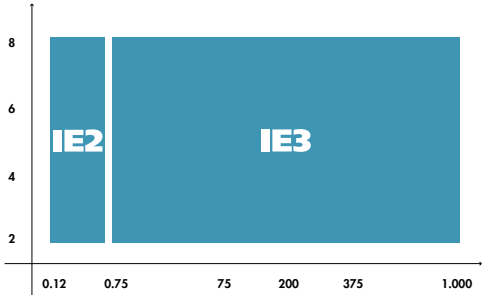
Requirements for the eco-design of electric motors and the use of variable speed drives were set out in Regulation (EC) 640/2009 on 22nd July 2009 then amended by Regulation (EU) 4/2014 on 6th January 2014.
This regulation was superseded on 25th October 2019 by Regulation (EU) 2019/1781, which sets out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

The **Regulation EU 2019/1781 and Amendment EU 2021/341** specify efficiency requirements for single speed three-phase motors from 0.12 to 1000kW, 2, 4, 6 and 8 poles, 50 Hz, 60 Hz and 50/60 Hz, and introduce in all UE countries the following MEPS:

FIRST STEP: AS OF 1ST JULY 2021

IE2 level: 0.12 to 0.55 kW

IE3 level: 0.75 to 1.000 kW



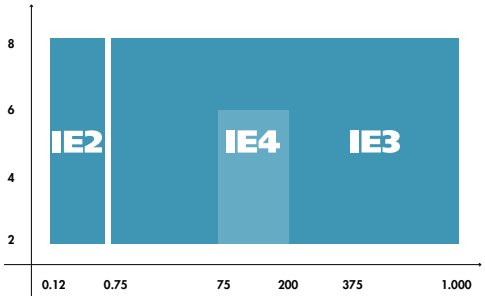
SECOND STEP: AS OF 1ST JULY 2023

IE2 level: 0.12 to 0.55 kW

IE3 level: 0.12 to 1.000 kW
(All Ex motors, Single-phase motors)

IE3 level: 0.75 to 1.000 kW

IE4 level: 75 to 200 kW



Regulation, Standard	EU 2019/1781 and Amendment EU 2021/341 - IEC 60034-30-1:2014
Testing Method	IEC 60034-2-1:2014
Regulation Scope	• Three-phase single speed motors: 0.12kW - 1000kW - 2,4,6 and 8 poles • 50 Hz, 60 Hz, 50/60 Hz • Continuous duty operation (S1, S3>80%, S6>80%) • Brake motors • TEFC and TEAO design • Ex motors (excluded Ex eb)
Meps	Since 01.07.2021 **Energy Efficiency IE3 – 0.75 to 1000kW** **Energy Efficiency IE2 – 0.12 to 55kW**
Exclusions	• Non continuous duty motors (duty<80%) • TENV design • Motors above +60°C and below -30°C
Future	Since 01.07.2023 **Energy Efficient IE4 – 75 to 200kW** **Energy Efficient IE3 – 0.75 to 1000kW** **Energy Efficient IE2 – 0.12 to 55kW** **Energy Efficient IE2 – 0.12 to 1000kW (All Ex motors, single-phase motors)**

USA & CANADA

Regulation, Standard	DOE 10 CFR Part 431 – Subpart B (USA) Amendment 13 to Energy Efficiency Regulation (Canada)
Testing Method	IEEE 112-2004, CSA C390-10
Regulation Scope	• Three-phase motors: 1HP - 500HP - 2,4,6 and 8 poles • Continuous duty operation (S1) • Up to 600V • 60Hz or 50/60Hz • Continuous duty operation (S1) • TEFC and TENV design
Meps	Since 01.06.2016 in USA and 28.06.2017 in Canada **NEMA Premium (IE3)**
Exclusions	• All non S1 motors • Converter motors

AUSTRALIA & NEW ZEALAND

Regulation, Standard	GEMS ACT 2019, IEC 60034-30-1
Testing Method	IEC 60034-2-1:2014
Regulation Scope	• Three-phase motors: 0.73kW -185kW – 2,4,6 and 8 poles • Up to 1100V • 50Hz or 60Hz • All service duty operation (except S2) • TEFC and TEAO design
Meps	Since 10.07.2019 **Energy Efficient (IE2)**
Exclusions	• S2 motors • Converter motors • Integral Gear motors

BRAZIL - MEPS SCHEME

Regulation, Standard	Portaria n. 01/2017 – ABNT NBR 17094-1
Testing Method	NBR 17094
Regulation Scope	• Three-phase motors: 0.12kW - 370kW – 2,4,6 and 8 poles • Up to 1000V • 60Hz or 60/50Hz • Service duty operation S1 or S3≥80% • TEFC and TEAO design
Meps	Since 01.09.2019 **Energy Efficient IR3 (IE3)**
Exclusions	• All non S1motors • All non S3<80% motors

CHINA – ENERGY LABEL

Regulation, Standard	Decree n.35 - GB 18613-2020
Testing Method	GB / T 1032
Regulation Scope	• Three-phase motors: 0.12kW to 1000kW - 2,4,6 and 8 poles • Up to 1000V • 50Hz or 50/60Hz • Service duty operation S1 or S3≥80% • TEFC design
Meps	Since 01.06.2021 **Energy Efficient GB3 (IE3)**
Exclusions	• All non S1motors • Non-ventilated motors • Special motors for specific machines requirements

KOREA – MEPS SCHEME

Regulation, Standard	MKE-2017-206 – KS C IEC 60034
Testing Method	KS C IEC60034-2-1
Regulation Scope	• Three-phase motors: 0.75kW to 375kW - 2,4,6 and 8 poles • Up to 600V • 60Hz • Service duty operation S1, S3≥80% • TEFC design
Meps	Since 01.10.2018 **Energy Efficient (IE3)**
Exclusions	• S2 motors • Converter motors • Non-ventilated motors

JAPAN – ENERGY SAVING ACT

Regulation, Standard	Energy Saving Act / Top Runner Program – JIS C 4034-30
Testing Method	IEC60034-2-1
Regulation Scope	• Three-phase motors: 0.75kW to 375kW - 2,4 and 6 poles • Up to 1000V • 50Hz, 60Hz or 50/60Hz • Service duty operation S1, S3≥80%
Meps	Since 01.04.2015 **Energy Efficient (IE3)**
Exclusions	• S2 motors • Converter motors • Ex motors

REST OF THE WORLD

Many Countries are recognizing the importance of Energy Efficiency in electric motors and its potential economic and environmental impact and are working on developing mandatory minimum energy performance standards to be implemented in the near future.
These standards are expected to follow the IEC60034-30-1 classification.