Development and Implementation of Energy Efficiency Standards & Labeling Programs for Motor in China

CNIS LIUREN

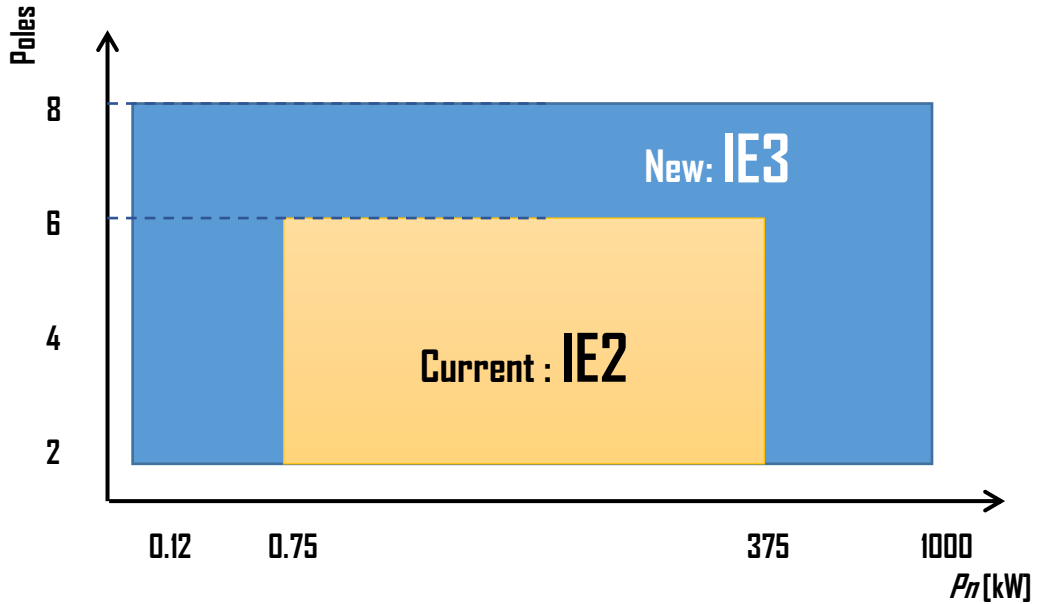
Update of MEPS & CEL

Intro: MEPS

China MEPS standard GB18613-2020 was released on May 29, 2020 to replace GB18613-2012. The implementation will be done on June 1, 2021.

Old standard (valid until 2021.5.31)

Applies to 'normal motors' - single speed, three phase 50 Hz, 1000 V and below, enclosed self ventilated, design N, squirrel cage induction motors for continuous duty classes S1 and S3 ≥80%, general purpose motors or Ex motors.



New standard (starting from 2021.6.1)

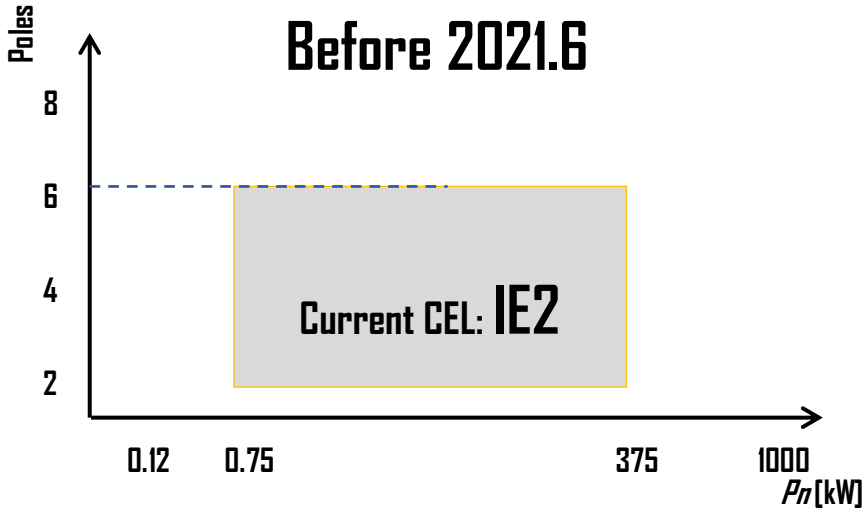
Applies to 'normal motors' - single speed, three phase 50 Hz, 1000 V and below, enclosed self ventilated, design N, squirrel cage inductions motors for continuous duty classes S1 and S3 ≥80%, general purpose or Ex motors and single phase motors 690 V and below, 50 Hz, 0.01 - 0.37 kW.
GB 18613-2020 standard defines efficiency classes as Grades where the Grade 3 is lowest and equivalent to IE3, Grade 2 equivalent to IE4 and Grade 1 the highest one requiring 20% less losses compared to IE4, equivalent to IE5.

Intro: Label

China Energy Label (CEL) defines rules and scope which need to be registered and marked with China Energy label.

Old CEL (valid until 2021.5.31)

the coverage is same as the standard

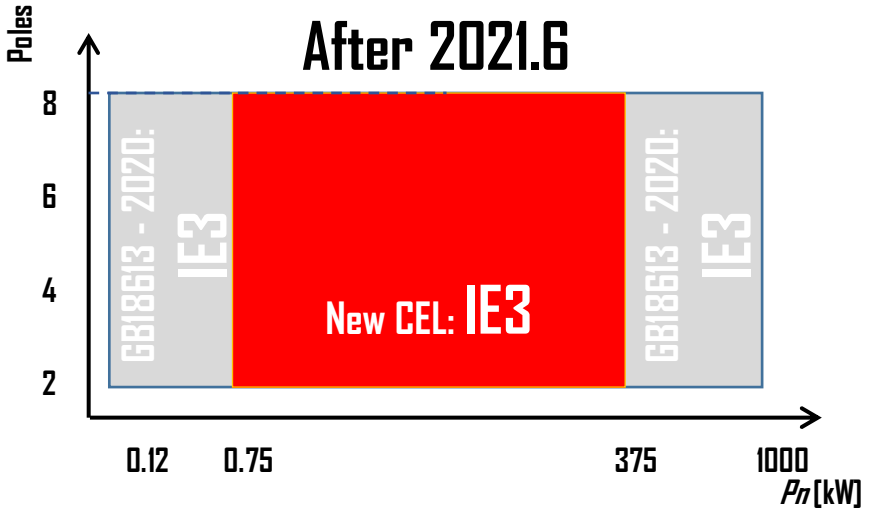


New CEL (starting from 2021.6.1) .

The official file released in June, 2021.

not same as standard.

Applies to 'normal motors' - single speed, three phase 50 Hz, below 1000 V, totally enclosed fan cooled, design N, squirrel cage induction motor for continuous duty classes S1 and S3 ≥80%, general purpose and Ex-motors.



Changes

Main changes:

Compared with energy efficiency standard for motors (GB 18613 - 2012), the following changes are made in version 2020 (GB 18613 – 2020):

1. Scope: three-phase asynchronous motors covering 0.12~1000kW;
   Requirements on small power motors added;
2. Indexes: for three-phase asynchronous motors, MPES in version 2012 requires IE2, while MPES in version 2020 requires IE3;
   for small motor are optimized, but still within the scope from IE1~IE2, which vary slightly depending on products.
3. target limit value and energy conservation evaluation value (the original grade 2 indexes) are canceled
4. All sentences are mandatory throughout the standard.

GB 18613 - 2012	GB 18613 - 2020	IEC60034-30-2:2016
	Grade 1	IE5
Grade 1	Grade 2	IE4
~~Grade 2~~	Grade 3	IE3
Grade 3		IE2

Different

Difference between IEC standard and China Mandatory Motor standard:

Similarities:

indicator for three-phase asynchronous motors have been completely the same with those in the latest IEC60034-30-2;

Differences:

frequency control are not considered;

Permanent magnet motor and other types of motor are not considered;

Only 50Hz is considered.

	GB 18613 - 2020	IEC60034-30-2:2016	note
Scope	0.12-1000kW three-phase partial low-power single-phase motors	0.12-1000kW three-phase, single-phase and synchronous motors	Different
indicator	See the standard	See the standard	Requirements for three-phase asynchronous motors are the same, and those for other motor are different
Number of poles	2,4,6,8 poles	2,4,6,8 poles	Same
Index setting	3 grades from Grade 1 to Grade 3	5 grades from IE1 - IE5	Index settings are different: IE1 refers to the lowest energy efficiency, while in GB, Grade 1 indicates the highest efficiency

Effects

The motor industry and market in China have witnessed dramatic change since the first mandatory energy efficiency label standard for motors was enacted in 2002, which plays a very positive role in accelerating energy conservation and emission reduction in China.

Effects of MEPS and CEL

- MEPS standard and CEL system have been implemented since 2002 and 2005 respectively, both of which have made great contributions to China's energy conservation and emission reduction. Data of Ministry of Industry and Information Technology indicates that, according to the statistics of 24 provinces, autonomous regions, municipalities and cities specially designated in the state plan that have reported the implementation status of key tasks of the motor energy efficiency improvement plan, more than 75 million kW high-efficiency motors have been promoted nationwide, including over 38 million kW low-voltage high-efficiency motors, over 22 million kW high-voltage high-efficiency motors and over 14.7 million kW permanent magnet high-efficiency motors.
- All provinces, autonomous regions and municipalities throughout China have set up and appropriated more than 2.5 billion yuan of special funds for improving motor energy efficiency, kicked out 21.08 million kW inefficient motors, renovated 17.1 million kW motors in terms of energy conservation, and re-produced 7.91 million kw kicked out motors. A total of 121 million kW were achieved through promotion of high-efficiency motors, kicking out of low-efficiency motors in use, energy-conservation renovation of motor systems and remanufacturing of kicked-out motors. The market share of high-efficiency motors has increased from 4% to about 25% at present; The running efficiency of the motor system is improved from 70% ~ 75% to 80% ~ 85%. Comprehensive annual electricity saving is about 11.3 billion kWh, equivalent to 1.39 million tons of standard coal, and carbon dioxide emission reduction is 3.475 million tons.
- According to the data of CEL indicates, as stipulated in GB18613-2012, 67.6% of products on sale shall reach the energy efficiency level 3 (IE2), and the rest shall reach the energy efficiency levels 1 and 2 (IE3, IE4) 13.7% as of 2019.
- As stipulated in GB18613-2020, the products on sale will exceed 70% in 2024 (based on the prediction of statistical data model), which indicates huge potential in energy conservation.

Effects of MEPS and CEL

- **Improvement of the industry**
  - **Before:** low yield of high-efficiency products; **After:** high ratio of high-efficiency products
  - **Before:** almost zero export of high-efficiency products; **After:** world-leading export of high-efficiency products
  - **Before:** no active energy consumption management; **After:** intelligent operation energy efficiency management
- **Changes in industry**
  - **Before:** slow update in design; **After:** active promotion of design efficiency
  - **Before:** cheap materials without considering energy efficiency; **After:** cost-effective and efficient materials
- **Changes in consumers' attitude**
  - **Before:** choose cheap motors; **After:** choose efficient motors
  - **Before:** unwilling to update outdated motors; **After:** actively update outdated motors
  - **Before:** unwilling to apply energy conservation measures; **After:** actively apply energy conservation measures

Barriers of MEPS & CEL in China

Barriers

- Slow update in standards
  - The previous edition of the standard was formulated in 2012, and it was revised after 8 years when the market has changed rapidly;;
- Simple MEPS indicator setting principles
  - MEPS revisions have generally aimed at only eliminating the bottom 20% efficiency of the market;
  - Setting a firm principle based on maximizing energy savings that are technically feasible and economically justified may help improve the stringency of China, s MEPS program and reduce the need for frequent revisions.
- Motor system matching not considered
  - Frequency conversion and motor system matching are not considered, although the indicators are consistent with IEC standards;
  - System efficiency is the goal of future development.
- MEPS supervision
  - Insufficient market regulatory;
  - The industry is still not standardized, and there are still a small number of products that do not meet the standards and labeling requirements
- Energy and material conservation does not equal to emission reduction and full life cycle
  - Lack of awareness - it is not enough if we just simply consider energy and material conservation
  - The comprehensive energy consumption of products in the whole life cycle should be considered as well.

Future

In our view
MEPS mean lower energy costs and emissions

The main aim of any MEPS has to be improved energy efficiency. While harmonization of regulations is a worthwhile goal, the primary objective of MEPS is to ensure energy efficiency. MEPS should not act as a barrier to market entry or affect fair competition. Additionally, MEPS should consider ecological justification, specially, several energy efficiency initiatives are ongoing with regard to motors and other equipment such as pumps and compressors.

Future Steps

- Regional energy planning: offer the optimal scheme from the energy consumption side
- Plan equipment energy efficient with a systematic thinking for better energy conservation and emission reduction
- Promote intelligent equipment to obtain the optimal system matching and effect
- Consider the full life cycle process of motors

1. Satisfy the energy conservation and emission reduction by improving the energy efficient of such important equipment as motors and motor systems in accordance with the requirements of the Fourteenth Five-Year Plan.
2. Strengthen the international exchange and industry-college-institute cooperation, further improve the energy efficiency of motors, and promote the efficient motor products and technologies. Strive to achieve peak carbon dioxide emissions by 2030 and achieve carbon neutrality by 2060.

Thanks for your listening