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**Die casting machine - Energy efficiency limits and
energy efficiency rating**

压铸机 能效限定值及能效等级

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Die casting machine - Energy efficiency limits and energy efficiency rating

1 Scope

This document specifies the terms and definitions, energy consumption test and calculation, energy efficiency rating, energy saving indicator, labeling of energy efficiency grade, and parameter description for energy efficiency limits and energy efficiency rating of cold-chamber and hot-chamber die casting machines.

This document is applicable to the energy consumption determination and energy efficiency rating of cold-chamber and hot-chamber die casting machines (hereinafter referred to as "die casting machines").

2 Normative references

The contents of the following documents, through normative references in this text, constitute indispensable provisions of this document. Among them, for dated references, only the edition corresponding to that date applies to this document. For undated references, the latest edition (including all amendments) applies to this document.

GB 20906 Safety requirements for high pressure metal diecasting units

GB/T 21269 Cold chamber die casting machines

JB/T 6309.1 Hot chamber die casting machine - Part 1: Basic parameters

JB/T 6309.2 Hot-chamber diecasting machine - Part 2: Testing of the accuracy

JB/T 6309.3 Hot-chamber diecasting machine - Part 3: Technical requirements

3 Terms and definitions

The terms and definitions defined in GB/T 21269 and JB/T 6309.1 and the following ones apply to this document.

3.1

3.5

Energy saving indicator

The die casting machine reaches the highest specific value of electrical energy consumption allowed by energy saving products.

3.6

Injection time

The time required for the whole process from slow injection start to fast injection and pressurization.

4 Energy consumption test and calculation

4.1 Test instrument

4.1.1 Clamping force tester: The accuracy of the test sensor shall not be less than 0.5%.

4.1.2 Three-phase power tester/electric power analyzer/electrical energy quality analyzer: The accuracy is not less than 2%.

4.2 Test requirements

4.2.1 The energy consumption test of die casting machine is carried out under the conditions of air injection.

4.2.2 At the center of the moving and fixed die mounting plate, it shall install the die backer. The material and dimension of the die backer of the hot-chamber die casting machine shall meet the requirements in JB/T 6309.2. The dimension of the die backer of the cold-chamber die casting machine shall be greater than or equal to $0.8b \times 0.8b$ (b is the inner size between the tie bars). The thickness of the die backer shall be set according to the minimum thickness of the die-casting die in GB/T 21269. And rags shall be filled at the feeding inlet of the die backer. During the test, the safety of the die casting machine shall meet the requirements of GB 20906. After debugging, the die casting machine is in a stable working state. The technical requirements and performance of the cold-chamber die casting machine shall meet the requirements in GB/T 21269. The technical requirements and performance of the hot-chamber die casting machine shall meet the requirements of JB/T 6309.2 and JB/T 6309.3.

4.2.3 The test parameters of the cold-chamber die casting machine shall meet the requirements of Table 1. The empty cycle time shall meet the requirements of Table 2.

4.2.6 The test shall include the energy consumption generated by the following actions or components:

- a) Main drive actions, including die-closing, die-opening, accumulator charging, injection, injection return, ejection and ejection return of die casting machines;
- b) No-load ejection movement;
- c) Electrical control devices;
- d) Internal maintenance devices (provided by the manufacturer), such as electrical component cooling system, lubrication system, hydraulic oil cooling system;
- e) For hot-chamber die casting machines, it also includes holding furnace, nozzle heating and gooseneck heating, nozzle temperature and gooseneck temperature settings:
 - 1) For zinc alloy die-casting, it shall be set to 380 °C;
 - 2) For magnesium alloy die-casting, it shall be set to 650 °C.

4.2.7 The oil temperature of the hydraulic system shall be between 30 °C and 55 °C.

4.2.8 The injection plunger tracking of the cold-chamber die casting machine shall not be selected.

4.2.9 The nozzle action selection of the hot-chamber die casting machine shall be fixed nozzle.

4.3 Test method

The test method is as follows:

- a) Confirm the integrity of the prototype under test;
- b) Reliably connect the three-phase power tester to the complete-machine power inlet end of the die casting machine;
- c) According to Table 1 and Table 2, set the parameters of the cold-chamber die casting machine; complete the filling of Table 1. According to Table 3 and Table 4, set the parameters of the hot-chamber die casting machine; complete the filling of Table 3;
- d) After the prototype under test enters the state of continuous operation in

fully automatic mode, and after confirming that the prototype under test reaches thermal equilibrium, start the energy consumption test;

- e) For each test, the number of empty cycles shall meet the requirements of 4.2.5.

4.4 Data acquisition

After the energy consumption test is over, on the human-machine interface of the three-phase power tester and the prototype under test respectively, the following data shall be collected:

- a) Total machine related electrical energy, E , in kilowatt-hours ($\text{kW} \cdot \text{h}$);
- b) Power factor of the total machine, ϕ ;
- c) Number of cycles, n , in cycles;
- d) Time of one empty cycle of the prototype under test, t , in seconds (s).

4.5 Energy consumption calculation

4.5.1 The energy consumption per cycle, E_d , is calculated according to formula (1):

$$E_d = \frac{E}{n} \dots\dots\dots (1)$$

Where:

E_d - Energy consumption per cycle, in kilowatt-hours per cycle ($\text{kW} \cdot \text{h}/\text{cycle}$);

E - Total machine related electrical energy consumption, in kilowatt-hours ($\text{kW} \cdot \text{h}$);

n - Number of empty cycles, in cycles.

4.5.2 The specific value of electrical energy consumption, E_b , is calculated according to formula (2):

$$E_b = \frac{E_d}{F} \dots\dots\dots (2)$$

Where:

E_b - Specific value of electrical energy consumption, in kilowatt-hours per kilonewton cycle [$\text{kW} \cdot \text{h}/(\text{kN} \cdot \text{cycle})$];

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