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Replacing GB 19153-2009

Minimum Allowable Values of Energy Efficiency and Energy Efficiency Grades for Displacement Air Compressors

容积式空气压缩机能效限定值及能效等级

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Foreword

This Standard was drafted as per the rules specified in GB/T 1.1-2009.

This Standard replaced GB 19153-2009 *Minimum Allowable Values of Energy Efficiency and Energy Efficiency Grades for Displacement Air Compressors*. Compared with GB 19153-2009, this Standard has the following major technical changes besides the editorial modifications:

--- Adjust the scope of the standard (see Clause 1 of this Edition; Clause 1 of 2009 Edition);

--- Change the terms from actual volume flow rate to volume flow rate of packaged compressor; from input power of air compressor to power of air compressor; from input specific power of air compressor to the specific power of air compressor (see 3.1, 3.2, 3.3 of this Edition; 3.1, 3.2, 3.3 of 2009 Edition);

--- Add the definition of variable speed rotary air compressor (see 3.5 of this Edition);

--- Delete the target energy efficiency limit value of air compressor and the energy saving evaluation value of air compressor (3.5, 3.6 of 2009 Edition);

--- Increase the energy efficiency indicators for some products (see Table 1, Tables 3~6 of this Edition; Tables 1~7 of 2009 Edition);

--- Add the energy efficiency evaluation of variable speed oil-injected rotary compressor (see 4.2 of this Edition);

--- Unify the energy efficiency indicators of general-use oil-injected screw air compressor, oil-injected scroll air compressor, oil-injected vane air compressor into the energy efficiency indicators of general-use oil-injected rotary air compressor (see Tables 1 and 2 of this Edition; Tables 6 and 7 of 2009 Edition);

--- Unify the energy indicators of miniature, general-use reciprocating piston air compressor into the energy efficiency indicators of reciprocating piston air compressor (see Table 3 of this Edition; Tables 3 and 5 of 2009 Edition);

--- Modify and add the requirements for test and calculation method (see Clause 6 of this Edition; Clause 5 of 2009 Edition);

--- Delete the inspection rules (see Clause 6 of 2009 Edition);

--- Add the conversion of specific power of air compressor to isentropic efficiency of air compressor and work efficiency of air compressor (see Appendix A).

This Standard was proposed by and under the jurisdiction of the Standardization

Minimum Allowable Values of Energy Efficiency and Energy Efficiency Grades for Displacement Air Compressors

1 Scope

This Standard specifies the energy efficiency grades, energy efficiency limit values, test and calculation methods for the displacement air compressors.

This Standard is applicable to:

a) General-use oil-injected rotary air compressors (including general-use oil-injected screw air compressors, general-use single-screw air compressors, general-use oil-injected vane air compressors and oil-injected scroll air compressors with drive motor power of 1.5kW~630kW, exhaust pressure of 0.25MPa~1.4MPa;

b) General-use variable-speed oil-injected rotary air compressors (including general-use variable-frequency oil-injected screw air compressors and integrated permanent-magnet variable-frequency screw air compressor) with drive motor power of 2.2kW~315kW, exhaust pressure of 0.25MPa~1.4MPa;

c) General-use reciprocating piston air compressors (including miniature reciprocating piston air compressors and general-use fixed reciprocating piston air compressors) with driving motor power of 0.75kW~75kW and exhaust pressure of 0.25MPa~1.4MPa;

d) Oil-free reciprocating piston air compressor with drive motor power of 0.55kW~22kW and exhaust pressure of 0.4MPa ~ 1.4MPa;

e) Directly drive portable reciprocating piston air compressor.

2 Normative References

The following documents are essential to the application of this document. For the dated documents, only the versions with the dates indicated are applicable to this document; for the undated documents, only the latest version (including all the amendments) are applicable to this document.

GB/T 3853 Displacement Compressor - Acceptance Tests

GB/T 4975 Displacement Compressors Vocabulary - General

GB/T 13279 Stationary Reciprocating Piston Air Compressor for General Use

GB/T 13928 Reciprocating Piston Micro Air Compressor

GB/T 26967 Oil Injected Single Screw Air Compressor for General Use

JB/T 4253 Oil Flooded Sliding Vane Air Compressor for General Use

JB/T 6430 Oil Injected Screw Air Compressor for General Use

JB/T 7662 Displacement Compressor Vocabulary - Rotating Compressor

JB/T 8933 Oil-Free Reciprocating Piston Air Compressors

JB/T 8934 Direct Drive Portable Reciprocating Piston Air Compressors

JB/T 9107 Reciprocating Compressors - Vocabulary

JB/T 10972 General-Use Variable-Frequency Oil-Injected Screw Air Compressor

JB/T 11423 Oil-Injected Scroll Air Compressor for General Use

JB/T 13345 Integrated Permanent-Magnet Conversion Frequency Screw Air Compressors

3 Terms and Definitions

For the purpose of this document, the terms and definitions given in GB/T 3853, GB/T 4975, GB/T 13279, GB/T 13928, GB/T 26967, JB/T 4253, JB/T 6430, JB/T 7662, JB/T 8933, JB/T 8934, JB/T 9107, JB/T 10972, JB/T 11423 and JB/T 13345 and the following apply.

3.1 Volume flow rate of packaged compressor

The actual air volume flow at the standard exhaust position of the air compressor unit, which is converted to the full temperature, full pressure, and component status of the standard intake position.

3.2 Packaged compressor input power; input power of air compressor

The total input power required by the air compressor unit to complete the compressed air output.

NOTE: The total input power does not include the power used by the compressed air aftertreatment equipment integrated in the air compressor unit.

3.3 Specific energy requirement of a packaged compressor; input specific power

Under specified operating conditions, the ratio of the power of the air compressor unit to the volumetric flow rate of the unit.

3.4 Minimum allowable values of energy efficiency for air compressor

The maximum unit specific power allowed by the air compressor under specified conditions.

3.5 Variable speed rotary air compressor

The air compressor, during the running process, the speed of the main drive motor is automatically adjusted through technologies such as frequency conversion to achieve a change in volume flow.

NOTE: Frequency conversion technology is only used to set the speed of the compressor's main motor; and the compressor whose rated speed cannot be changed during running period is not a variable speed air compressor.

4 Energy Efficiency Grades

4.1 The energy efficiency grade of air compressors is divided into 3 grades, of which Grade-1 has the highest energy efficiency. The energy efficiency value of each grade of the air compressor under the specified operating conditions shall be no greater than the values specified in Tables 1~6.

4.2 The energy efficiency grades of all types of air compressors shall comply with the provisions in Tables 1~6. among them:

a) The energy efficiency grade of general-use oil-injected rotary air compressors shall meet the requirements of Table 1;

b) The energy efficiency grade of general-use variable-speed oil-injected rotary air compressors shall meet the requirements of Table 2;

c) The energy efficiency grade of general-use reciprocating piston air compressors shall meet the requirements of Table 3;

d) The energy efficiency grade of the oil-free reciprocating piston air compressor shall meet the requirements of Table 4;

e) The energy efficiency grade of directly drive portable reciprocating piston air

6.2 Test method

The air compressor energy efficiency test is performed as specified in GB/T 3853; and the suction temperature shall be measured in the range of 5°C ~ 40°C.

6.3 Input specific power

6.3.1 The calculation method for the input specific power test shall be in accordance with GB/T 3853.

6.3.2 The input specific power of the air compressor is calculated according to Formula (1):

$$e_{VC} = K_{14} \cdot \frac{P_{corr}}{q_{V,corr}} \qquad \cdots\cdots(1)$$

Where:

e_{VC} – input specific power of air compressor, in kW/(m^3/min)

P_{corr} – input specific power measured and calculation-corrected as per GB/T 3853, in kW;

$q_{v,corr}$ – volume flow rate of packaged compressor measured and calculation-corrected as per GB/T 3853, in m^3/min;

K_{14} – Suction temperature correction coefficient of the input specific power, dimensionless, it shall be calculated as per the Formula (2):

$$K_{14} = \sqrt{\frac{T_x}{293.2}} \qquad \cdots\cdots(2)$$

Where:

T_x – actually-measured suction temperature of air compressor, in K.

6.3.3 The input specific power of the variable-speed oil-injected rotary air compressor shall be calculated by weighting the input specific power at 100%, 70% and 40% volume flow rate of the full-load compressor according to Formula (3):

$$e_{VC} = \sum_{i=1}^{n} (e_{VC,i} \cdot f_i) \qquad \cdots\cdots(3)$$

Where:

e_{VC} – input specific power of variable-speed oil-injected rotary air compressor, in kW/(m^3/min);

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