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JAPANESE INDUSTRIAL STANDARD

**Performance Testing and
Inspection Methods by Air
for Open Type Reciprocating
Refrigerant Compressors**

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In the event of any doubt arising,
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Performance Testing and Inspection
Methods by Air for Open Type
Reciprocating Refrigerant Compressors

B 8603-1989

1. Scope

This Japanese Industrial Standard specifies the methods by use of air for the performance inspection of open type reciprocating compressors used in refrigerating machines, hereinafter referred to as the "compressors".

- Remarks 1. Those units and numerical values shown in braces { } in this Standard are based on the conventional units and are appended for informative reference.
2. The pressures shown in this Standard mean gauge pressures (static pressures) unless otherwise specified.

2. Inspection Items

The inspection items for compressors shall be as shown in the following.

The accuracy of the main measuring instruments used for inspection shall be as specified in Attached Table.

- (1) Continuous running inspection.
- (2) Vacuum inspection
- (3) Discharge valve leakage inspection
- (4) Capability inspection

3. Continuous Running Inspection

3.1 Testing Method The test shall be performed by setting the suction pressure at the atmospheric pressure and keeping the discharge pressure at the value shown in Table 1, reading the temperatures of respective parts of the compressor at intervals of 15 minutes, and continuously running the compressor until these temperatures become constant.

Applicable Standard and Reference Standards: See page 17.

Table 1. Discharge Pressure

Type of machine	Discharge pressure kPa {kgf/cm ² }
Water-jacketed compressor	200 {2.04}
Water-jacketless compressor	100 {1.02}
Booster ⁽¹⁾	Specified pressure ⁽²⁾ [within 200 {2.04}]

Notes ⁽¹⁾ Low-stage-side compressor used in a two-stage compression refrigerating machine.

⁽²⁾ The value specified by the manufacturer.

Measurement shall be carried out for the undermentioned items. However, measurement may be omitted for items of which measurement is difficult for reasons of the construction of the compressor.

- (1) Room temperature
- (2) Atmospheric pressure
- (3) Cooling water inlet temperature
- (4) Cooling water flow-rate
- (5) Power source voltage
- (6) Power source frequency
- (7) Compressor suction pressure
- (8) Compressor suction temperature
- (9) Compressor discharge pressure
- (10) Compressor discharge temperature
- (11) Motor input power
- (12) Motor input current
- (13) Compressor rotating speed
- (14) Outside temperature of outer end bearing
- (15) Outside temperature of main bearing (driving side)
- (16) Outside temperature of main bearing (reverse-driving)
- (17) Shaft seal temperature
- (18) Cylinder wall temperature
- (19) Cylinder head cover temperature

- (20) Lubricating oil temperature (but where an oil cooler is provided, temperatures at inlet and outlet of oil cooler)
- (21) Supply oil pressure
- (22) Cooling water outlet temperature

3.2 Criteria In the continuous running test, the conditions of (1) and (2) shall be satisfied, with a smooth and stable running condition and without abnormal sounds or vibrations or variations in pressure and motive power.

- (1) The limits of temperature rise in respective parts of the compressor shall be as shown in Table 2.

Table 2. Limits of Temperature Rise

Unit: °C

Location	Limit of temperature rise		
	Water-jacketed compressor		Water-jacketless compressor
	Rotating speed lower than 700 min ⁻¹	Rotating speed 700 min ⁻¹ min.	
Outside of outer end bearing	30	40	60
Outside of main bearing			
Shaft seal			
Lubricating oil			
Cylinder wall			

Remarks 1. (Temperature rise) = (measured temperature) - (room temperature)

- 2. The limit value of temperature rise for compressors with a rotating speed exceeding 2000 min⁻¹ shall be the value specified by the manufacturer.

- (2) The supply oil pressure regulating valve shall be easy to operate and, be able to adjust the pressure so as to make the difference pressure between the supply oil pressure and the suction pressure 150 kPa {1.53 kgf/cm²} or larger.

4. Vacuum Inspection

The highest achievable vacuum on the suction side shall be measured by opening the discharge side of the compressor to atmosphere, completely closing the suction stop valve, and using a mercury manometer or a calibrated vacuum gauge. The value of vacuum shall meet the requirements of Table 3.

Table 3. Vacuum

Division of compressors	Vacuum kPa {mmHg}
Compressors of 1 kW and over	-93.3 {-700} min.
Compressors of under 1 kW	-90.7 {-680} min.

5. Discharge Valve Leakage Inspection

When the suction valve is closed and a pressure of 400 kPa {4.08 kgf/cm²} or higher is applied to the discharge side of the compressor in suspended condition, the compressed air shall not flow back into the crankcase to such an extent as to affect the performance of the compressor.

6. Capacity Inspection

6.1 Test Conditions and Test Items In this test, measurement shall be performed for the following items by setting the suction side pressure at the atmospheric pressure and under four kinds of test conditions of pressure ratio - at the discharge pressure when the discharge pressure adjusting throttle valve is open, a discharge pressure of 400 kPa {4.08 kgf/cm²}, and at least two different kinds of discharge pressures intermediate between the above pressures.

- (1) Room temperature
- (2) Atmospheric pressure
- (3) Cooling water inlet temperature
- (4) Cooling water flow-rate
- (5) Power source voltage
- (6) Power source frequency
- (7) Compressor suction pressure
- (8) Compressor suction temperature
- (9) Compressor discharge pressure
- (10) Test items specified in either of the following (10.1), (10.2), and (10.3) required for measuring the air flow-rate to be carried out according to the testing methods specified in 6.2.
 - (10.1) In the case of using orifice (refer to Fig. 1)
 - (a) Measuring pipe-line diameter
 - (b) Orifice aperture diameter
 - (c) Temperature before orifice