

JIS

JAPANESE INDUSTRIAL STANDARD

Portable type oil burnig space
heaters for industrial use

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Portable type oil burning space
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1. Scope

This Japanese Industrial Standard specifies portable type oil burning space heaters⁽³⁾ mainly for industrial use⁽²⁾ of 0.7 kg/h or over to 9 kg/h or under in fuel consumption⁽¹⁾ using kerosene, gas oil or heavy oil as fuel (hereafter referred to as heaters).

Notes ⁽¹⁾ Values calculated in accordance with 7.2.8 (1).

⁽²⁾ These are used at factories, places of business, construction work sites, etc., and of which main objects are for heating, drying and the like.

⁽³⁾ The heaters which are provided with wheels, handles and the like for conveyance, and are easy to transfer in construction, and which are classified according to systems and types as shown in 2, discriminating from stationary type.

Remarks 1. The applicable standards to this Standard are given in Attached Table 1.

2. Units and numerical values given in { } in this Standard are in accordance with traditional units, and are informative values.

2. Types and symbols

The types and symbols of the heaters, classifying into the hot wind system and radiation system by the transmitting system of heat, and into the direct fire type and indirect type by the exhausting system of burnt gas, shall be as given in Table 1.

Table 1. Types and symbols

Symbol		Transmission system of heat	Symbol		Exhausting method of combustion gas
W	Hot wind system	That system which sends out the generated heat in a burning chamber as hot wind using a blower.	D	Direct fire type	That type which exhausts the burnt exhaust gas, as it is, in a room.
			I	Indirect type	That type which exhausts the burnt exhaust gas to the outdoors.
R	Radiation system	That system which radiates the generated infrared rays or far infrared rays, heating a screen, radiation plate, radiation tube or the like by the generated heat in a burning chamber.	D	Direct fire type	That type which exhausts the burnt exhaust gas, as it is, in a room.
			I	Indirect type	That type which exhausts the burnt exhaust gas to the outdoors.

Remarks: Among those as given in Table 1, the "hot wind system direct fire type" shall be specified in the text of this Standard, and the "hot wind system indirect type", "radiation system direct fire type" and "radiation system indirect type" shall be specified in Annex 1, Annex 2 and Annex 3, respectively.

3. Performances

3.1 Service performances The service performances of heaters shall satisfy the following respective items:

- (1) The starting of heaters shall be that of an automatic lighting, as well as easy in lighting operation and requires no dangerous operation.
- (2) The wheels, handle, knobs, etc. of the heaters shall be those which do not causing deformation and abnormality of actuation easily during operation.
- (3) The operation, repair and scavenging of the heaters shall be made simply, and shall be those which are not liable to cause danger on these occasions.
- (4) No dangerous operation shall be required in extinguishing the heaters, and it shall be performed rapidly and securely.

3.2 Quality performances The quality performances of heaters shall be examined in accordance with 7., and results shall conform to Table 2.

Table 2. Performances

Item		Performance	Test method
Actuations	Actuation of blower	There shall be no abnormal sound, vibration, loosening of joint part, and abnormal run-out of belt or the like.	7.2.1 (1)
	Running actuation	There shall be no instability of actuation, abnormal sound, vibration and poor connection.	7.2.1 (2)
	Actuation of overheat preventing device	It shall actuate without hindrance.	7.2.1 (3)
Leakage	Fuel system	There shall be no leakage.	7.2.2 (1)
	Oil tank	There shall be no leakage.	7.2.2 (2)
Pressurizing of oil tank		There shall be no leakage.	7.2.3
Burning and temperature rise	Surface temperatures of operating parts ⁽⁴⁾ such as knobs and handles	In the case of metal, porcelain, etc., 25°C or under in difference between the measuring temperature and the room temperature. In the case of plastics, 35°C or under in difference between the measuring temperature and the room temperature.	7.2.4 (1)
	Surface temperatures of parts ⁽⁵⁾ liable to be touched with hands	140°C or under.	7.2.4 (2)
	Floor surface temperature under the heater	80°C or under.	7.2.4 (3)
	Oil temperature ⁽⁶⁾	25°C or under in difference between the measuring temperature and the room temperature.	7.2.4 (4)
	Surface temperature of oil tank	25°C or under in difference between the measuring temperature and the room temperature.	7.2.4 (5)
	Temperatures of windings of electric motor and electro-magnetic pump	100°C or under for Class A insulation 115°C or under for Class E insulation 120°C or under for Class B insulation 140°C or under for Class F insulation 165°C or under for Class H insulation	7.2.4 (6)

Table 2. (Continued)

Item		Performance	Test method	
Burning and temperature rise	Burning conditions	(1) It shall be ignited reliably, and be free from pulsation of flame. (2) There shall be no indication of adherence of unburnt oil and the like to the burning chamber.	7.2.5	
	Load burning	No abnormal burning shall take place.	7.2.6	
Performances	Heat output	+ 10 % of the marked value.	7.2.7	
	Fuel consumption	+ 10 % of the marked value ⁽⁷⁾ .	7.2.8	
	Extinguishing time	Pressure spray system 10 s or under Rotary atomizing system 20 s or under Jet spray system 10 s or under Vaporizing system 20 s or under	7.2.9	
	Overturn extinguishing performance	It shall be extinguished within 10 s.	7.2.10	
	Ratio of carbon mono-oxide to carbon dioxide in burnt exhaust gas (CO/CO ₂)	0.002 or under.	7.2.11	
	Electric power consumption	That of 100 W or under in rated power consumption	+ 15 % of the marked value.	7.2.12
		That of exceeding 100 W in rated power consumption	+ 10 % of the marked value.	
Insulation resistance of electric appliances		1 MΩ or over.	7.2.13	
Withstand voltage		It shall withstand for 1 min.	7.2.14	
Power failure resisting performance		After re-electrification, no danger shall take place.	7.2.15	
Voltage variation characteristics		It shall start normally, and shall actuate normally.	7.2.16	

Table 2. (Continued)

Item			Performance	Test method
Vibrations			(1) When it has been vibrated by 100 cm/s^2 {100 Gal}, the extinguishing device shall not be actuated. (2) When it has been vibrated by 200 cm/s^2 {200 Gal}, the fuel supply shall be interrupted and be extinguished within 10 s. Furthermore, in both cases, no abnormal burning shall take place, and no abnormality such as breakage and deformation shall occur on respective parts of the heater.	7.2.17
Watering ⁽⁸⁾ resistance	Insulation resistance		1 M Ω or over.	7.2.18
	Withstand voltage		It shall withstand for 1 min.	
Corrosion resistance			There shall be no remarkable corrosion, and no abnormality on function shall occur.	7.2.19
Humidity resistance	Insulation resistance		1 M Ω or over.	7.2.20
	Withstand voltage		It shall withstand for 1 min.	
Thermal resistance			There shall be no swell, deformation and other abnormality which are impedimental on functions.	7.2.21
Oil resistance			Mass variation rate shall be $\pm 20 \%$.	7.2.22
Durability	Repeated actuations	Operating parts such as knobs and others	No abnormality shall take place, when operated 10000 times continuously.	7.2.23 (1)
		Contactors of lighting device		
		Moving parts of seismic automatic extinguishing device	No abnormality shall take place, when actuated 10000 times continuously.	7.2.23 (2)
		Solenoid valve ⁽⁹⁾	There shall be no abnormality.	7.2.23 (3)

Table 2. (Continued)

Item	Performance	Test method
Noise	85 dB or under.	7.2.24
Low temperature starting performance	It shall start normally.	7.2.25
Functional performances of portable parts	There shall be no hindrance on functions.	7.2.26

- Notes (⁴) Those parts which are touched with hands in order to regulate burning conditions during using. However, in the case where tools or the like are used, it shall not be so limited.
- (⁵) Other parts and others excluding the flue, outer plates within 30 cm the periphery of flue, intake opening of secondary air and attaching opening of burner.
- (⁶) In the case where the oil tank is incorporated with the heater body, it means the temperature at the oil surface of oil tank, and in the case where the oil tank is separated from the heater body, it means the temperature of the oil surface in the oil quantity regulator.
- (⁷) It means the marked value by the manufacturer being based on the calculated value in accordance with 7.2.8 (1).
- (⁸) Application shall be limited to the specially ordered goods.
- (⁹) It shall be applicable to the relevant type of machine.

4. Construction

4.1 General construction The general construction of the heater shall be in accordance with the following:

- (1) It shall be so constructed that the burning of the burner is not affected or hindered by the action of negative pressure or positive pressure generated by the forced ventilation.
- (2) Respective parts of the heater shall be so constructed as to have sufficient strength and stability, when it is transported and operated.
- (3) Respective parts of the heater shall be free from oil leakage and the like. In the cases of feed oil, maintenance inspection, repair, etc. it shall be so constructed that the spilled oil neither be splashed and transferred to the following parts, nor be accumulated.
 - (a) The portions exposed to the burnt gas.

- (b) The portions where it is difficult to find oil spillage or to clean.
- (c) The portions of which temperatures become 25°C or higher than the room temperature during running.
- (d) Electric components and electric wirings.
- (e) Other portions which are liable to generate fire.

4.2 Construction by types The construction of the hot wind system direct fire type shall be in accordance with Attached Fig. 1.

4.3 construction of portable parts The portable parts such as wheels, handles for conveyance shall be so constructed that these are both safe and easy to transfer.

4.4 Construction of electric equipments, wiring parts, etc. The construction of electric equipments, wiring parts, etc. of the heater shall be in accordance with 4.5 (Construction of machines using power source for general household) of JIS S 3030.

Furthermore, the heater shall either be attached with source electric lines, or be so constructed as to be attached with source electric lines easily by terminals or the like.

4.5 Construction of seismic automatic extinguishing device The construction of the seismic automatic extinguishing device of the heater shall be in accordance with 4.6 (Construction of seismic automatic extinguishing device) of JIS S 3030.

4.6 Constructions of safety devices and control devices The heater shall be equipped with the following safety devices and control devices, and the construction thereof shall be in accordance with 4.7 (Safety devices and control devices) of JIS S 3030.

- (1) Lighting safety device
- (2) Burning control device
- (3) Electric failure safety device (excluding that for preventing the danger at the time of electric failure)
- (4) Overheat preventing device
- (5) Over-load protecting device of motor (excluding that of 100 W or under in the rated output of motor)

4.7 Construction and capacities of oil tank The construction of the oil tank of the heater shall be in accordance with 4.4 (Construction of oil tank) of JIS S 3030, and otherwise the capacities of the oil tanks shall be in accordance with Table 3.

Table 3. Capacities of oil tanks

Division	Capacity of oil tank
Open oil tank	95 l or under
Airtight oil tank	20 l or under

Remarks: The capacity of separation type oil tank shall be in accordance with the Law of Fire.

4.8 Construction of fuel pipings The fuel pipings shall be in accordance with the following:

- (1) The joint parts of the fuel pipings shall be so constructed that the pipes are attached securely, free from oil leakage, as well as be detachable.
- (2) The fuel pipings and joint parts shall be so constructed as not liable to be deformed and dislocated easily.
- (3) The fuel pipings shall generally use metal pipes. However, in the case where it is not appropriate to use metal pipes for constructional or service reasons, those conforming to JIS K 6343 and JIS S 3022 or those other than metal pipes having the performances equal to or superior to these may also be used.

5. Appearance

The appearance of the heater shall be fine in finish of respective parts, and be free from harmful defects in use such as rust and burrs.

6. Materials

6.1 Material of heaters The materials to be used for the heaters shall be those which are able to withstand to the temperatures under usual service conditions.

Furthermore, for the places liable to generated harmful rust in use, any corrosion resistant material shall be used, or an appropriate rust proof treatment shall be processed.

In addition, these shall be those having sufficient strength, safety and durability in use.

6.2 Materials of burner The materials of burner to be built in the heater shall be durable to the temperature under usual service conditions, and shall be those having sufficient strength, safety, oil resistance, corrosion resistance and durability.

6.3 Materials of safety devices and control devices The materials of the safety devices and control devices shall be those of having sufficient strength, safety and durability, considering the thermal resistance, oil resistance, corrosion resistance and low temperature resistance.

6.4 Electric conductive materials The electric conductive material shall be copper or copper alloy, or that having electrical and mechanical durabilities equal to or superior to these.

6.5 Material of oil tank The material of oil tank shall be that having thermal resistance, oil resistance, corrosion resistance, safety and durability.

6.6 Materials of portable parts The materials of portable parts shall be those durable to temperature at usual service conditions and having sufficient strength, oil resistance, corrosion resistance and durability.

7. Test methods

7.1 General conditions The general conditions of tests shall be in accordance with the following:

- (1) The test location shall be free from the flow of air which is influential to the measurement of temperature, and the temperature shall be $20 \pm 10^{\circ}\text{C}$.

In addition, the air before start of the test shall not include 0.2 % or over of carbon dioxide and 0.002 % or over of carbon monoxide.

- (2) The voltage of source used in the testing shall be the rated voltage.
- (3) All of the components to be mounted under usual service conditions of the heater shall be attached.
- (4) The fuel to be used in the burning test shall be that conforming to JIS K 2203, JIS K 2204 and JIS K 2205.
- (5) Measuring instruments shall be those conforming to Attached Table 1 (measuring instruments and the like) of JIS S 3031, or those having the accuracies equal to or superior to those.
- (6) The machine to be tested shall be installed horizontally.

7.2 Performance tests The performance tests shall be in accordance with the following:

7.2.1 Actuation test Allow the heater to actuate under usual service conditions, and investigate whether any abnormalities exist in the actuating order and functions of machines from start to stop.

- (1) Actuation of blower Under stopped conditions of burning, repeat 3 times the actuations of the blower for 5 minutes or over, and investigate the presence of abnormal sound, vibration, loosening of joint parts, and abnormal runout of the belt and the like.
- (2) Running actuation Repeat 3 times the actuations for 5 minutes or over, to investigate for the existence of the unstable actuation, abnormal sound, vibration and loosening of joint parts.

- (3) Actuation of overheat preventing device Stop the actuation of blower for hot wind, or allow the blowing rate to decrease, allow the hot wind temperature to rise so as to attain overheat condition, and investigate whether the overheat preventing device actuates or not.

7.2.2 Leakage test Under the usual service conditions of the heater, after 3 times of the actuation of 5 min or over have been repeated, investigate for the presence of the leakage of fuel system and oil tank, under heated conditions, in accordance with the following. In this case, the oozing of oil shall be considered to be leakage.

- (1) Leakage of fuel system Investigate for the presence of the leakage from the overall fuel system.
- (2) Leakage of oil tank Seal hermetically all of the parts other than the part from which the test pressure is to be applied and apply the pneumatic pressure of 50 kPa {0.5 kgf/cm²} for 1 min to investigate for the presence of leakage in water. However, for that which is liable to be deformed by the test pressure, the jig which prevents deformation may also be used.

7.2.3 Pressurizing test of oil tank Fill the oil tank with water, seal hermetically all of the parts other than the part from which the test pressure is to be applied, and apply the hydraulic pressure of 150 kPa {1.5 kgf/cm²} for 1 min to investigate for the presence of leakage.

7.2.4 Temperature rise test of each part In the temperature test of each part, carry out continuous running for 30 min or over from the start of burning and until an equilibrium is attained, measure each temperature in accordance with the following, and obtain the maximum value.

- (1) In the measuring method of the surface temperatures of the operating parts such as knob and the like, use a thermocouple, fix its temperature measuring part so as to contact with the parts to be measured of temperatures sufficiently, measure the maximum temperature, and calculate the difference between this and the room temperature at this time.
- (2) In the measuring method of the surface temperatures of the parts which are liable to be touched with hands, use a thermocouple, fix its temperature measuring part so as to contact with the parts to be measured of temperatures sufficiently, and measure the maximum temperature.
- (3) In the measuring method of the floor surface temperature under the heater, use a thermocouple in the temperature measuring method given in Attached Fig. 2, fix its temperature measuring part so as to contact with the parts to be measured of temperatures sufficiently, and measure the maximum temperature.

- (4) In the measuring method of the oil temperature of the oil tank annexed to the heater, measure the maximum temperature at adjacent to feed oil opening for that of construction using an open oil tank, or at adjacent to the opening part of oil receiving dish for that of construction using an airtight oil tank, each during burning, and calculate the difference between this and the room temperature at this time.
- (5) In the measuring method of the surface temperature of the oil tank annexed to the heater, measure the surface temperature at each part within 10 mm the periphery of feed oil opening for an open oil tank, or at about center part of outside of the shell near the combustion room for an airtight oil tank. Use a thermocouple in measurement, fix its temperature measuring part so as to contact with the parts to be measured of temperatures sufficiently, measure the maximum temperature, and calculate the difference between this and the room temperature at this time.
- (6) In the measuring method of the temperatures of windings of motor and electromagnetic pump, measure the resistances of the windings at the time of start of test and at the time of completion of test in accordance with the resistance method specified in JIS C 4004, and calculate the temperatures of windings from the following formula.

$$\delta = \frac{R_2 - R_1}{R_1} (T + t_1) + (t_1 - t_2)$$

where, δ : temperature rise of winding immediately after the test (°C)

R_2 : resistance of winding under hot condition t_2 (°C)
..... (Ω)

R_1 : resistance of winding under cold condition t_1 (°C)
..... (Ω)

t_1 : ambient temperature when R_1 has been measured under cold condition (°C)

t_2 : ambient temperature when R_2 has been measured under hot condition (°C)

T : constant (copper wire: 235)

7.2.5 Burning test In the burning test, install the heater so that it conforms to 7.1, run for 3 minutes or over from the time of running has started, and investigate the following burning conditions while running continuously.

- (1) The state of lighting and the conditions of flame.
- (2) The presence of indication of adhesion of unburnt oil and the like to the burning chamber.

7.2.6 Load burning test In the load burning test, allow the heater to burn at an increase of 10 % in respect to the marked fuel consumption, and investigate the burning conditions.