

# Safety Standards

The safety of the component part is an important consideration in equipment design. In real life, however, a part-by-part analysis of component quality and design is too time consuming for design and quality personnel. To get around this problem, safety standards have been designed to assure component safety. The following section describes the safety standards with which Oriental Motor is concerned.

## ■ Safety Standards

### 1. UL Standards (United States)



UL, or Underwriters Laboratories Inc., is a non-profit testing organization that was founded in 1894 by a group of American fire insurance companies. Their aim was to prevent loss of human life and damage to property from fires and other hazards by ensuring that machinery, tools and materials were safe. To this end, UL developed a variety of tests and research methods for machinery, tools and materials, which resulted in the compilation of the UL standards. These standards are used for common items such as electronic equipment, motor-powered devices and electronic parts. The most important aspect to the UL standards for a manufacturer is that legal provisions in many American states require that such products must have passed the relevant UL safety tests and be listed in the UL Directory before being offered for sale. Although some states do not explicitly require UL-listing by law, there are cases where insurers refuse to cover the risk of fire or damage caused by a product that is not UL-listed. This is almost equivalent to the legal sales restrictions in these other states, and under such circumstances the customer will obviously only purchase items that are UL-listed. For a product that is to be sold in the United States, recognition or listing by UL is recommended.

Also, UL has been accredited as a verification agency by the Standards Council of Canada (SCC) and recognized by all Canadian provinces. Therefore, it is possible to have testing for Canadian safety standards performed at UL. Products that are recognized as conforming with Canadian safety standards can display the c-UL mark and their sale and use is permitted in Canada.

### 2. CSA Standards (Canada)



CSA stands for "Canadian Standards Association", a private, non-profit testing organization established after an inquiry by the Canadian government. To protect human life and property from fire hazard and accidents, provincial laws in Canada forbid the sale and use of any electrical machinery, electrical parts, and so on, unless its safety has been confirmed by CSA. For this purpose, CSA has established standards detailing mandatory tests and requirements to ascertain component safety.

Also, the CSA has been accredited by the United States Occupational Safety and Health Administration (OSHA) as a national research and testing laboratory (NRTL) and is now able to undertake testing under American safety standards. Products that are recognized as conforming with American safety standards may display the CSA mark with NRTL added and their sale and use is permitted in the United States.

### 3. EN Standards (EU member states)



The European Union continues to coordinate the industrial and safety standards of individual member states under the aegis of the Council of European Standardization (CEN) and the Council of European Electrical Standardization (CENELEC). The unified standards for all of Europe are called the Harmonized Standards. The numbers for Harmonized Standards all begin with an "EN". EN standards apply to design and manufacture of products exported to the EU area. (IEC and VDE standards apply when an EN standard has not yet been enacted.)

Certification is given by private inspection organizations such as TÜV Rheinland and VDE. Qualifying products may display the various safety marks.

### 4. Japanese Safety Standards for Electrical Equipment



The Japanese safety Standard for Electrical Equipment was published to prevent danger and accidents that might result from poorly constructed electrical equipment are registered and approved. The sale and use of electrical products that do not comply with these standards is restricted or forbidden.

The products regulated under the Japanese Safety Standards for Electrical Equipment are electrical products in regular use in homes, offices, etc. They are classified into Class A and Class B electrical products according to the level of danger they present. The Japanese Safety Standards for Electrical Equipment was partially revised on July 1, 1995. Many products were shifted from Class A to Class B. Electrical Product Law labeling was made mandatory only for Class A, while the labelling requirement for Class B was abolished. Verification testing is now performed at the Japan Safe Electrical Environment Research Center (JET) .

## ■ Standards for Motors and Fans

The following is a listing of the standards pertaining to electrical motors and fans.

### 1. UL Standards

- ① UL519: Impedance Protected Motors  
Establishes requirements for impedance protected motors.
- ② UL547: Thermal Protectors for Motors  
Establishes requirements for thermal protectors as well as for motor/thermal protector combinations.
- ③ UL1004: Electric Motors  
Establishes general requirements for all types of electrical motors.
- ④ UL507: Electric Fans  
Establishes general requirements for electrical fans and blowers that have an input power of 600V or lower. Note that motor parts of fans and blowers must also comply with requirements of UL519, UL547 and UL1004.
- ⑤ UL2111: Overheating Protection for Motors  
Establishes requirements for overheating protection for motors. Previously, requirements for impedance protected motors were established under UL519 while requirements for thermal protectors for motors were established under UL547. UL2111 was published on March 28, 1997, combining UL519 and UL547, and partially integrating C22.2 No. 77 (Motors With Inherent Overheating Protection) under the CSA standards.

### 2. CSA Standards

- ① C22.2 N0.100: Motors and Generators  
Establishes general requirements for motors.
- ② C22.2 N0.77: Motors with Inherent Overheating Protection  
Establishes special requirements for motors with inherent overheating protection that supplement those of C22.2 N0.100.
- ③ C22.2 N0.113: Fans and Ventilators  
Establishes general requirements for fans.

### 3. EN Standards

VDE and TÜV approved motors and fans are evaluated in accordance with the items required for motors under the following standards. Forty-eight hour humidity experiments are conducted in addition experiments with motor and fan characteristics.

- ① EN60034 (=IEC60034, DIN VDE0530)  
Stipulates general requirements for motors.
- ② EN60950 (=IEC60950)  
**Safety of information technology equipment, including electrical business equipment.**  
This standard covers information technology equipment, including electrical business equipment.

### 4. IEC Standards

IEC60664 (DIN VDE0110)  
Stipulates insulation distances for motors.

## ■ Standards for Control Circuits

The following is a listing of the standards pertaining to Control Circuits.

### 1. UL Standards

- ① UL508 Industrial Control Equipment  
This standard covers industrial control devices used to start, stop, regulate, control, or protect motors. This standard covers speed control packs.
- ② UL508C Power Conversion Equipment  
This standard covers equipment used to supply power to control motors activated by a frequency or voltage which is different to the input supply voltage. This standard covers drivers.
- ③ UL1917 Solid-state Fan Speed controls.  
These are standards for control of single-phase 300V max variable-speed fans.

### 2. CSA Standards

- ① C22.2 N0.14 Industrial Control Equipment  
This standard covers industrial control equipment used to start, stop, regulate, control or protect motors. This standard covers speed control packs and drivers.

### 3. EN Standards

- ① EN60950 (=IEC60950)  
**Safety of information technology equipment, including electrical business equipment.**  
This standard covers information technology equipment, including electrical business equipment.
- ② DIN VDE0160 (Overvoltage test, EMC excluded)  
**Electric equipment use in electrical power installations and assembly into electrical power installations.**  
This standard covers electric equipment use in electrical power installations and assembly into electrical power installations.
- ③ EN50178 (Overvoltage test, EMC excluded)  
**Electric equipment for use in power installations .**  
General regulation of electronic equipment that can be used in power facilities.

IEC: International Electrotechnical Commission  
The IEC promotes unification and coordination of international standards on electrical and electronic equipment. IEC standards are issued with the ultimate goal of having individual countries reflect international standards within their own standards.

DIN: Deutsches Institute für Normung e.V.  
The German standards association. Its standards range from basic to wide-ranging standards that cover all industrial fields.

VDE: Verband Deutscher Elektrotechniker e.V.  
This German association of electrical engineers enacts safety standards for electricity that are issued as DIN-VDE standards.

## ■ Safety Considerations and Tests

A comparison of the items evaluated by various testing standards reveals that there are a few points of particular concern for motors and fans.

### 1. Construction

#### ① Devices to prevent overheating

UL, CSA, EN and IEC standards require that any equipment using a motor also possess a device to protect the motor from overheating which can be caused by overload, intentional or unintentional locking of the rotor, etc. All Oriental Motor approved products include impedance protection or thermal protectors in the motor unit.

#### ② Insulation materials

Insulation classes are based on resistance to heat and are defined as shown in the following tables.

Table 1: Insulation class and temperature

Insulation Class	Maximum temperature
Class 90 (Y)	194°F (90°C)
Class 105 (A)	221°F (105°C)
Class 120 (E)	248°F (120°C)
Class 130 (B)	266°F (130°C)
Class 155 (F)	311°F (155°C)
Class 180 (H)	356°F (180°C)

Table 2: Insulation Materials

Safety standard	Insulation Materials
Japanese Safety Standards for Electrical Equipment (Fan)	Insulation materials that are registered or temporarily registered with the Japan Electrical Equipment Laboratory, the material experiment organization for the Japanese Safety Standard for Electrical Equipment, and have been assigned a heat resistance grade of class E[248°F(120°C)] are used.
UL Standards (Motor) CSA Standards (Fan)	All grommets, lead wires and some slot insulations are approved products while all other insulation materials satisfy UL and CSA standard requirements.
EN Standards (Motor) IEC Standards (Fan)	The insulation materials satisfy EN and IEC standard requirements.

#### ③ Minimum spacing between live materials

To prevent accidents caused by short circuits between live materials or between live materials and user-accessible materials (normally not live materials), minimum spacing distances between such materials have been defined. All our products comply with the relevant requirements.

#### ④ Enclosure Classifications

Classifications IEC60529 and IEC60034-5 categorize the protective enclosure of equipment into grades for dust exclusion and water tightness. The testing methods are as shown in Table-3.

Example: IP54



An “x” is used when one of the two protection classes is not specified in the name (e.g., IPX5 or IP4X).

Table 3: Meanings of Markings and Testing Conditions

IP Code	Degree of protection against access to hazardous parts and against solid foreign objects	
First Number	Description	Definition and Test Conditions
IP0X	None	None
IP1X	Protection against approach by hands	Cannot be penetrated by a solid object 1.97in. (50mm) or more in diameter.
IP2X	Protection against approach by fingers	Cannot be penetrated by a solid object .79in. (12mm) or more in diameter.
IP3X	Protection against tips of tools, etc.	Cannot be penetrated by a solid object .09in. (2.5mm) or more in diameter.
IP4X	Protection against wire, etc.	Cannot be penetrated by a solid object .04in. (1.0mm) or more in diameter.
IP5X	Protection against dust	Cannot be penetrated by dust that could interfere with normal operation.
IP6X	Completely dust-proof design	Cannot be penetrated against penetration by dust

IP Code	Degree of protection against ingress of water	
Second Number	Brief Description	Definition and Test Conditions
IPX0	None	None
IPX1	Protection against water drops falling vertically.	Water drops falling at a rate of 3 to 5 mm/min. from a height of 7.87 in. (200mm) for 10 minutes.
IPX2	Protection against water drops falling vertically over a 15° range.	Water drops falling over a 15° range at a rate of 3 to 5 mm/min. from a height of 7.87 in. (200mm) for 10 minutes.
IPX3	Protection against water drops falling vertically over a 60° range.	Water drainage falling over a 60° range at a rate of 10 ℓ /min. from a height of 7.87 in. (200mm) for 10 minutes.
IPX4	Protection from spray of water from all directions.	Water sprayed from all directions from a distance of 11.81 in. (300) to 11.69 in. (500mm) at a rate of 10 ℓ /min. for 10 minutes.
IPX5	Protection against jets of water from all directions.	Jets of water sprayed from a distance of 9.84 ft. (3m) from all directions at a rate of 12.5 ℓ /min. at a pressure of 30 kPa for 3 minutes.
IPX6	Protection against strong wave-like jets of water.	Jets of water sprayed from a distance of 9.84 ft. (3m) from all directions at a rate of 100 ℓ /min. at a pressure of 100 kPa for 3 minutes.
IPX7	Usable after immersion in water under fixed conditions.	Immersion to a depth of 3.3 ft. (1m) for 30 minutes.
IPX8	Usable under water	Determined through cooperation between user and manufacturer.

#### ⑤ Capacitor

VDE certified products are certified for the motor and fan alone. Combinations of accessory capacitors and motors have passed the tests in EN60950 Annex B, Item 8.

#### ⑥ Motor fan protective gear (finger guards)

When a fan is used in a device, measures must be taken to protect people from harm.

The **FG□D** Oriental Motor finger guard is designed to pass all tests stipulated under the UL Standards, CSA Standards and Japanese Safety Standards for Electrical Equipment when used on a compatible product.

(Protective gear cannot be certified as stand-alone equipment, since it is used when installed on another product as an accessory.)

#### ⑦ Plug cord for connecting power supply

The optional plug cord that can be used with the **MU** series of fans, and use terminals to connect with the power supply, is recognized by UL (unlisted component) and certified by CSA and JET.

## 2. Performance

### ① Temperature Test

Standard Test Item	UL Standard (Class A)	CSA Standard (Class A)
Overload operation test for thermal protected motor	Winding temperature is 284°F(140°C) or less when temperature is stabilized and the thermal protector does not work with applying maximum load.	
Locked-rotor temperature rise test for impedance protected motor	Winding temperature is 302°F(150°C) or less when a 72-hour locked-rotor test is performed at a test voltage of 120V or 240V (when rated voltages are 115V or 230V) with rated capacitor connected, rotor locked or capacitor short circuited. No deterioration on insulation material of the windings after above test.	Winding temperature maintains constant value of 302°F(150°C) or less when a locked-rotor test is performed at a test voltage of 120V or 240V (when rated voltages are 115V or 230V) with rated capacitor connected, rotor locked or capacitor short-circuited.
Locked-rotor temperature rise test for thermally protected motor	Winding temperature is in the following range when 72-hour a locked-rotor test is performed at a test voltage of 115V or 240V (when rated voltages are 115V or 230V) with rated capacitor connected. <ul style="list-style-type: none"> <li>• Maximum temperature in first hour is 392°F(200°C) or less.</li> <li>• Maximum temperature of after one hour is 347°F(175°C) or less.</li> <li>• Calculated average value of maximum temperature and minimum temperature after one hour is 302°F(150°C) or less.</li> </ul>	

- For winding temperature rise, Oriental Motors products are designed to meet the UL standard and CSA standard for Class A insulation and the insulation material is also a Class E heat-resistant grade under the Japanese Safety Standards for Electrical Equipment.
- The following are by the Japanese Safety Standards for Electrical Equipment:  
Rated operation tested: The constant winding temperature reached for rated operation must be no greater than 239°F(115°C).  
Rotor constraint protection performance: When the test piece is placed on a wooden table at least .39 in.thick (10mm thick) and covered with gauze and the constraint test is run at rated frequency and rated voltage until the temperature stabilizes, the test piece, wooden table, and gauze must not burn and the insulation resistance at 500 V must be 0.1 M min.
- Temperature tests are stipulated in the EN and IEC standards (grade E insulation). Oriental Motor products have all been certified to perform normally in these tests.

### ② Endurance Test

Standard Test Item	UL Standard (Class A)	CSA Standard (Class A)
Endurance test for Impedance protected motors	No deterioration on insulation material of windings when continuing the locked-rotor test for another 12 days after the aforementioned 72-hour locked-rotor test, i.e., a total of 15 days.	No motor damage and no insulation deterioration when continuing the locked-rotor test for another 15 days after the aforementioned 72-hour locked-rotor test, i.e., a total of 18 days.
Endurance test for thermal protected motor	No deterioration on insulation material of windings when continuing the locked-rotor test for another 15 days after the aforementioned 72-hour locked-rotor test, i.e., a total of 18 days.	No motor damage and no insulation deterioration when continuing the locked-rotor test for another 15 days after the aforementioned 72-hour locked-rotor test, i.e., a total of 18 days.

- The UL and CSA standards cover the endurance tests as noted above. These rules were established to prevent motors and fans from burn-out when they are locked.
- All Oriental Motor approved products passed these tests. Our approved fans employ high-grade (V-0) non-flammable resins for the fan blades.
- Temperature tests are stipulated in the EN and IEC standards (Grade E insulation). Oriental Motor products have all been certified to perform normally in these tests.

### ③ Dielectric Voltage - Withstand Test

All motors and fans are sufficient to withstand this test, which is carried out by applying the voltage of the table below between motor case and lead wires, without insulation breakdown.

Standard Test Item	Japanese Standard (Class E)	UL Standard (Class A)	CSA Standard (Class A)
Less than 150V	1000V 1minute	60Hz, 1000V, 1minute	60Hz, 1000V, 1minute
Over 150V	1500V 1 minute	Common to impedance protected and thermally protected motors	Common to impedance protected and thermally protected motors

- The EN and IEC standards (Grade E insulation) stipulate 1500V for 1 minute.

## ■ Evidence of Product Approval

### 1. Approved Mark

The following marks are indicated on the nameplates of approved products.

- Japanese Safety Standards for Electrical Equipment Certified by Japan Electrical Testing Laboratory inc. . . . . 

- UL recognized component . . . . . 

- Recognized to Canadian safety requirements under the component Recognition Program of Underwriters Laboratories Inc. . . . . 

- CSA certified component . . . . . 

- UL certified by Canadian Standards Association . . . . . 

- EN and IEC certified component. (indicates that VDE, TÜV Rheinland or DEMKO has certified the product meets EN or IEC standards.) . . . . .   




### 2. Factory Inspection

Even after a product has been recognized or certified, UL and CSA inspectors verify continued compliance of products and manufacturing process with the relevant standards by regular visits to the factory.

- UL: Four times a year
- CSA: Twice a year
- TÜV: Once a year
- VDE: Once a year
- DEMKO: Once a year
- JET: Once a year

How to Order

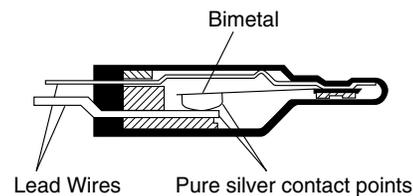
## ■ Overheating Protection Devices

Overheating may be caused by overload, no load or extremely small load, intentional or unintentional locking of the rotor or use in very high ambient temperatures. This results in a drastic shortening of the life of the insulation system or, in extreme cases, in fire.

To prevent degeneration of the insulation materials and burning out the windings as a result of overheating or rotor locking, our approved products use one of two methods of overheat protection; a thermal protector or impedance protection.

### 1. Thermally Protected Motors

Motors with a frame size of 2.76 in.sq. (70mm sq.), 3.15 in.sq. (80mm sq.), 3.54 in.sq. (90mm sq.) and axial flow fans with frame sizes of 6.30 in.sq. (160mm sq.), 7.09 in.sq. (180mm sq.), 7.87 in.sq. (200mm sq.) contain a built-in automatic return type of thermal protector. The construction of a thermal protector is shown in the following figure.



The thermal protectors employ a bimetal contact, with pure silver used in the contacts. Pure silver has the lowest electrical resistance of all materials and has thermal conductivity second only to copper

- Operating temperature of thermal protector
    - Open: 248°F±9°F(120°C±5°C) or 266°F±9°F(130°C±5°C)
    - Close: 170.6°F±59°F(77°C±15°C) or 179.6°F±59°F(82°C±15°C)
- Motor winding temperature where the thermal protector is working is slightly higher than the operating temperature listed above.

### 2. Impedance Protected Motors

Impedance protection is used in motors with frame sizes of 2.36 in. sq. (60 mm sq) fans with frame sizes smaller than 5.51 in.sq. (140 mm sq.) and **SMK** series. Impedance protected motors are designed with higher impedance in the motor windings so that even if the motor locks, the increase in current (input) is kept down and temperature does not rise beyond a certain constant level.

### 3. Brushless DC Motors

The motor and driver unit in Brushless DC motors is equipped with overloading and overheating protection features control temperature rises by cutting off the input current from the driver to the motor when a malfunction occurs.

### 4. Stepping Motors

Stepping motors are designed with impedance protection in case they are stopped with five-phase excitation (with the rated current flowing).

### 5. DC Fans

These fans are provided with solid state control circuitry that incorporates a limiting, current shut down circuit, which controls the fan during locked rotor conditions.

## ■ CE Marking

To distribute equipment within the European Union, the CE marking is mandatory for certifying that the equipment concerned complies with EC Directives (safety). To obtain a ruling that the equipment satisfies the required items of each directive, the manufacturer must usually verify that the equipment complies with the EN standards applicable to the EC Directives, or, if not available, with the IEC standards. The manufacturer then composes a declaration stating compliance with the directives and applies the CE marking. (However, depending on the risk of danger, formal testing by an approving authority may be required and the self-composed declaration is then issued after receiving proof of formal testing.)

The major scope of compliance and period of obligation are as follows:

**Machinery directives:** 98/37/EC Applicable to equipment with moving parts that could cause human injury. (Mandatory as of 1 January 1995)

**EMC directives:** 89/326/EEC, 92/31/EEC, 93/68/EEC Applicable to equipment that could cause electromagnetic interference (EMI) and equipment that could be affected by electromagnetic interference (EMS). (Mandatory as of 1 January 1996)

**Low voltage directive:** 73/23/EEC, 93/68/EEC Applicable to equipment used with 50-100VAC or 75-1500VDC. (Mandatory as of 1 January 1997)

### 1. The Advantages of Approved Components

Under EC Directives, not all components in a device or piece of equipment have to be approved. However, when nonapproved components are used, the manufacturer of the equipment must evaluate and verify the safety of the component itself. If approved components are used, the manufacturer has the advantage of the benefits listed below:

- 1) Simplified component safety evaluation.
- 2) Simplified documentation and testing when lodging equipment standards applications with an approving authority.

This makes it much easier for the equipment to comply with the necessary directives.

### 2. Oriental Motor's Approach to CE Marking

To ensure that the company's products comply with the low voltage directives, we have issued a declaration of voluntary compliance with the standards imposed by the approving authorities within the E.U. Our view is that the EMC Directives do not directly pertain to our products themselves since all of Oriental Motor sales are to equipment manufacturers. AC motors are outside the range of applicability of EMC Directives because it has been judged both theoretically and experientially that there is no influence on emissions or immunity. The controllers used in the company's products and equipment as well as equipment as a whole, including electrical components, are subject to the EMC Directives. Additionally, since the properties of equipment in relation to EMC Directives will vary depending upon the controller, electrical component configuration, wiring, general configuration and level of danger, clients should verify compliance with EC Directives themselves. When a client is using our products in other equipment, Oriental Motor will provide methods such as adequately efficient filters and ferrite cores required by EMC measures. Also, fans that function alone conform to EMC command commands.

## 3. Compliance (Note1).

Oriental Motor's products have received the following VDE, TÜV Rheinland and DEMKO approval.

	Applicable Standards				Certification Body
	EN 60950	DIN VDE 0160	EN60034-1.5.11	EN 50178	
AC Motors	○	—	—	—	VDE or DEMKO
Speed Control Motors	Motors	○	—	—	VDE or DEMKO
	Speed Control Packs	○	○	—	TÜV or DEMKO
Stepping Motors	Motors	○	—	○	VDE
	Driver	○	—	—	○
AC Fans	Axial Flow Fans	○	—	—	VDE
	Centrifugal Blowers	○	—	—	VDE or DEMKO
	Cross Flow Fans	○	—	—	VDE
DC Fans	○	—	—	—	DEMKO

•EN60034-11 is excluded for the motor section of stepping motors.

Clients should inquire at their local Oriental Motor sales office when a copy of the company's product approval or declaration of voluntary compliance with the low voltage directives is required for lodging an application with approving authorities.

### 4. Installation Conditions

The following installation conditions must be rigidly adhered to in order to ensure that products are used with greater safety. (Note 2).

Overvoltage Category: II (IEC60664-1)

Pollution Degree: Class 2 (IEC60664-1)

Protective Structure: Dependent on model.

### 5. Protection Against Electrocutation (Note 3).

Oriental Motor products are designed with Class 1 basic insulation. When being used, the following must always be observed:

- 1) Install products inside protective grounded enclosures so that they are out of the direct reach of users.
- 2) Always ground any product housing that is within the direct reach of users.

(Note 1)

Generally, EN60204-1 applies to electricity in industrial equipment and EN60950 applies to electrical business equipment and information technology equipment. EN60204-1 satisfies the requirements of EN60034-1 (IEC60034-1) but, for the incorporation of equipment, EN60950-conforming motors can be handled likewise.

(Note 2)

●Installation Category

This signifies the size of the shock produced at an input power terminal to which the equipment is directly connected.

Category II: Circuits, secondary circuits on transformers in industrial machinery, home appliances powered by commercial electrical power, office equipment and other power sources where major overvoltage are not produced.

Category III: Power supplies from primary circuits on transformers, general plant control panels and other power supplies where major overvoltages are anticipated.

- Pollution Degree

This signifies the level of pollution in the environment where the equipment can be used (regulated by IEC60664-1).

Degree 1: No possibility of machine contamination through pollution because the environment is normally clean and dry and completely free of pollutant particles (inside packed with plastic etc.)

Degree 2: Possible machine contamination through pollution due to the presence of charged particles with moderate pollutant forming tendencies (homes, offices, research laboratories).

Degree 3: Charged particles will contaminate machinery (boiler rooms and general plants).

In the event that the construction of the equipment creates internal pollution in equipment in a Degree 2 environment, that equipment must be designed to comply with a lower degree.

- Degree of Protection (Designed by IP Code as determined by EN60529)

This signifies the degree of protection against dust and water provided by the structure of the equipment. Equipment can be given a higher IP grade by providing protection with an appropriate enclosure.

- The company's motors have been assessed under EN60034-5 (IEC60034-5, IEC60529).

(Note 3)

Methods of protection against electrocution by equipment are divided into the following protection classes.

Class I Equipment: Equipment with basic insulation and protective grounding for protection against electrocution; at sections where electrocution is a possible danger, protection against electrocution should be provided through protective grounding in case the basic installation is damaged.

Class II Equipment: Equipment for which reinforced insulation or double insulation consisting of the basic insulation plus extra insulation is used as an added precaution. Therefore, there is no protective grounding as in Class II equipment.

Class III Equipment: Equipment for which all the power is fed from a SELV circuit (60 VDC max. etc). Therefore no danger of electrocution exists.

At Oriental Motor, the impact of industrial activity on the environment is taken as a serious issue.

Our entire company is tackling the issues of protecting the environment and is promoting activities for ISO14001 examination registration with participation by all employees.

## 1. Ozone Depleting Substances

It is known that the depletion of the ozone layer leads to a greater volume of ultraviolet rays reaching the earth's surface, producing skin cancer and damaging the earth's ecosystem. The manufacturing processes at Oriental Motor use no ozone depleting substances as defined by the Montreal Protocol (specific fluorocarbons and specific halons).

All ethanes and fluorocarbons, which had been used for cleansing, were abolished in February 1993.

## 2. Poly bromo biphenyl oxides

Plastics containing Poly bromo biphenyl oxides create the hazardous substance, bromide dioxin when incinerated. These have not been in use since the switch to non-Poly bromo biphenyl oxides in February 1997.

## 3. Other Steps Toward Environmental Preservation

The company is making extensive progress in the effective use of recycled paper and the elimination of polystyrene in packaging.