EXTERNAL ROTOR MOTORS

INTRODUCTION

The external rotor motor offers many attractive features such as space saving, compact design, optimum cooling, full speed controllability and low starting currents.

Single and three-phase motors are produced to the highest International Quality Assurance Standards.

Sealed-for-life ball bearings are fitted throughout the range with an L10 life expectancy of approximately 40,000 hours depending upon conditions of operation.

TEMPERATURE RANGE

The motors are designed to operate in the ambient temperature range of -40°C to +40°C, but external rotor motors are often capable of operating in higher ambient temperatures. Should you have such a need, refer your enquiry to one of our sales offices.

ENCLOSURE STANDARD

The minimum is IP44 in accordance with DIN40050 and AS 1939:1990.

SPECIAL FEATURES

Speed Control

External rotor motors are inherently suited to speed control using either electronic or auto-transformer controllers. Refer to page L-1 for details of the range of controllers available.

External rotor motors can be speed controlled by frequency inverters, however there are two restrictions that need to be adhered to.

1. The inverter must not be used to increase the speed to above the nominal speed.

2. The inverter must be positioned as close as possible to the fan; preferably adjacent to it.

Care must be taken when selecting speed controllers as the amperage drawn by some motors when being speed-controlled, can exceed the rated full load amps. This characteristic is more apparent at approximately 70% of full speed and must be considered when selecting the controller to ensure the controller rating is sufficient for all conditions.

Whilst the drawn amps may exceed the nominal nameplate amps, there is little likelihood of damage being done to the motor. The overload should be sized to accommodate the excess amperage.

A number of identical fans can be controlled from a single controller but the total amps of all the motors must not exceed 85% of the controller rating.

STAR/DELTA MOTORS

Most three-phase external rotor motors used with backward-curved centrifugal fans are fitted with 2-speed star/delta motors as standard.

These motors enable full speed to be obtained when connected in delta and a reduced speed when connected in star. The ratio of the speeds obtained is 1.3:1 (reduced speed in slip) which approximates to a slightly higher speed than the next synchronous speed down.

These speeds can be obtained by connecting directly to either delta or star. Alternatively, by using a star/delta switch, either speed can be obtained at will. Details of this product is given on page L-1.

THERMAL CONTACTS

Thermal contacts are fitted as standard to all external rotor motors.

Embedded deep in the windings of the motors, the contacts are bi-metal cutout design which are temperature-dependent. Should the temperature of the motor rise to the limit, the bi-metal cutouts activate and cut off the power, thereby providing full protection to the motor.
Re-starting the motors is achieved by two methods:-

- auto-reset
- manual-reset

The ‘auto-reset’ will permit the fan motor to automatically re-start when the windings cool down. It is recommended they be connected to a current control relay.

The ‘manual-reset’ type requires the thermal contacts to be wired to a remote trip contactor which has to be reset manually.

**SUPPLY VOLTAGE**

As the speed of external rotor motors can be controlled by varying the applied voltage they can be used where the voltage varies from the standard of 240V/1ph/50Hz or 415V/3ph/50Hz without detrimental effect to the motor. Indeed, on voltages as low as 200 volt on single-phase, or 346 volt on three-phase supply, only a slight reduction of the motor speed would be detected.

**TROPIC-PROOFING**

Tropic-proofing consists of an anti-fungal treatment of the windings. Further modifications may be necessary for high humidity applications.

**WARRANTY**

*Note that warranty is void if the thermal contacts are not used.*

AS/NZS3000:2007 wiring rules state that motors required to run unattended shall be fitted with over-temperature devices such as thermal overload relays. If this is not complied with warranty will be void.

A licensed electrical contractor or engineer, experienced in motor protection, should be engaged to assess the motors and specific requirements of the installation.

**STANDARD MOTORS**

**INTRODUCTION**

Constructed to appropriate Australian, European and International Standards, standard motors are used to drive a range of fans extending from window and wall units to large industrial axial flow and centrifugal fans.

**STANDARDS**

The standard motors used are foot, flange or pad mounted, metric type and totally enclosed as produced by most of the world’s major manufacturers. They will run continuously with the minimum of attention and have been selected for their universal interchangeability and availability in countries throughout the world. The motors comply with the appropriate British, Australian and International Standards as far as:-

- output
- performance
- dimensions
- minimum energy performance standard (MEPS) to AS/NZS1359.5:2004

are concerned.

**TEMPERATURE RANGE AND ALTITUDE**

In general the motors can operate in ambients from -30°C to +40°C at altitudes up to 1000 metres above sea level. Motors to operate outside this range can be supplied if required.

**ENCLOSURE STANDARD**

The minimum is IP54 in accordance with the appropriate standards. IP55 enclosure can be supplied for fully weatherproof applications.

**FINISH**

Standard finish is enamel paint top coat on suitable primer to give good appearance and protection for general usage. Alternative finishes such as epoxy coating can also be provided.
STANDARD MOTORS (Cont.)

SPEED CONTROL

Certain sizes of single and three-phase motors are suitable for variable speed control. If the fan is controlled by a variable speed drive, the installation must be compliant with CISPR14.1:2003 to satisfy EMC compliances.

BEARINGS

Unless otherwise nominated, all fans are fitted with ball or roller bearings. The bearing housing of motors up to frame size D132 as a minimum, are fully enclosed, sealed-for-life and therefore do not require maintenance.

Bearings are pre-packed with grease and, under normal circumstances, last for several years.

Larger frame sizes are fitted with lubrication nipples. When these motors are fitted to axial flow fans, lubricators, extended to the outside of the fan casing to facilitate lubrication, are optional. Grease relief valves must be fitted when extended lubrications are fitted.

ELECTRICAL SUPPLY

Motors are generally wound for 415V/3ph/50Hz or 220-240V/1ph/50Hz, however, we can provide motors wound for all voltage and frequency variations.

INSULATION

Insulation to Class F with Class B temperature rise is used throughout, allowing for operation in ambients up to +40°C. Motors for higher temperatures can be provided upon request.

TROPIC-PROOFING

Tropic-proofing consists of an anti-fungal treatment of the windings. Further modifications may be necessary for high humidity applications.

MULTI-SPEED MOTORS

Many applications require the maximum design conditions for only relatively short time periods, resulting in a waste of energy and consequently, a high running cost. To overcome this, fans can be supplied with 2-speed motors.

A wide range of motor speed combinations can be provided, based upon the motor synchronous speeds.

Using this method, power savings can be substantial, as well as generating much lower noise levels.

THERMAL PROTECTION

Thermal protection in the form of thermistors can be incorporated in any of the squirrel cage induction motors on request.

Thermistor overloads must be used in conjunction with these motors.

HIGH TEMPERATURE APPLICATIONS

When continuous operation in higher ambients is essential, the motor can be wound with Class H insulation.

The maximum continuous ambient temperature for Class H insulation is:

- Class H - 80°C

The above figure is a guide only as the maximum ambient depends upon the load being applied to the motor and the temperature rise of the motor.

If in doubt, refer to our sales office.

SMOKE-SPILL APPLICATIONS

Refer to page C-7.
MOTORS FOR HAZARDOUS AREAS

TYPES OF MOTORS

The following are the main groups of motors used in hazardous locations, but not all situations are covered. Should you have an application not covered by the following, please refer to one of our sales offices.

- Ex d flameproof motors for industrial use
- Ex e increased safety motors
- Ex n non-sparking motors
- D.I.P. dust ignition proof motors

COMPLIANCE TO STANDARDS

All motors suitable for use in hazardous areas are manufactured/modified in strict accordance with the conditions required by the relevant standards and the issued Certificate of Compliance, and are fully tested prior to despatch by the manufacturer.

SELECTION OF MOTORS FOR USE IN HAZARDOUS AREAS

There are a number of defined hazardous areas covering gases and dusts. It is therefore strongly recommended that the relevant Australian Standards and Statutory Authorities be consulted prior to final selection of the motor.

HAZARDOUS AREAS

Many gases, vapours and dusts or fibres which are generated, processed, handled and stored in industry are combustible. When ignited they may burn rapidly and with considerable explosive force if mixed with air in the appropriate proportions.

Areas where gases, vapours, dusts and fibres occur in dangerous quantities are classified as HAZARDOUS. Classification of areas are:

- gases, vapours, mists Class I
- dusts Class II

Groupings are further defined for either:

- mining (methane) Group I
- surface industries Group II
- dusts and fibres Group III

With Group II gases, they are further subdivided into sub-groups IIA, IIB, IIC, depending upon the ignition point of the gas.

ZONAL CLASSIFICATION is also required where explosive atmospheres are present and they indicate the probability of the presence of a flammable, combustible or explosive material, the extent, dimension and shape of the hazardous areas, together with the volume in which the hazardous material can be expected. There are three zones for each:

Gases and Vapours

- ZONE 0 - An area in which an explosive gas atmosphere is continuously present or is present for long periods of time.
- ZONE 1 - An area in which an explosive gas atmosphere is likely to occur in normal operation.
- ZONE 2 - An area in which a gas atmosphere is not likely to occur in normal operation and if it does occur, it will exist for a short period only.

Dusts

- ZONE 20 - Dust cloud likely to be present continuously or for long periods.
- ZONE 21 - Dust cloud likely to be present occasionally in normal operation.
- ZONE 22 - Duct cloud likely to occur in normal operation, but when it does, will only exist for a short period.
TEMPERATURE CLASSIFICATION

Hot surfaces can cause ignition of gases, vapours and dust, therefore it is necessary to ensure that the maximum surface temperature of equipment introduced into a hazardous area does not exceed the ignition temperature for the gas, vapour or dust in the hazardous area.

Group I Gases - Maximum Surface Temperature 150°C

Group II gases and Class II dusts are given a Temperature Class (T) based on the maximum surface temperature of the equipment.

Temperature Classes are:

- T1 - 450°C
- T2 - 300°C
- T3 - 200°C
- T4 - 135°C
- T5 - 100°C
- T6 - 85°C

Note: For Ex d flameproof apparatus the external surface is the measured surface. For other types of protection (e.g. Ex e) internal surfaces are of equal importance if the explosive atmosphere has access to them.

FLAMEPROOF MOTORS

Ex d, FOR INDUSTRIAL USE

Three-phase motors

These motors are certified to Ex d and can fit a wide range of products as shown throughout the catalogue. The motors are certified to Ex d Class 1, Zone 1 protection. The certificate covers gas groups IIA and IIB, temperature classification T4 and enclosure protection IP56.


Single-phase motors

Fans with single-phase Ex d motors are featured on pages F-3/7. These fans are certified to Ex d Class 1, Zone 1 protection. The certificate covers gas groups IIA, IIB and IIC, temperature classification T6 and enclosure protection IP66.


EXPLOSION PROOF MOTORS

Ex e, INCREASED SAFETY

Standard three-phase motors

These motors are certified to Ex e and can fit a wide range of products as shown throughout the catalogue. These motors are certified to Ex e Class 1, Zone 1 protection. The certificate covers gas groups IIA, IIB and IIC, temperature classification T3 and enclosure protection IP66.

The Standard complied with is AS/NZS60079.0:2005 and AS/NZS60079.7:2006. This Standard means the motors are also suitable for Ex n and DIP applications.

ELECTRICAL AND MECHANICAL SPECIFICATION

Voltage: Up to 500 Volts
Insulation: Class ‘F’
Enclosure: Totally enclosed, fan-cooled
Degree of Protection: Up to IP66
Frequency: 50 or 60 Hz

LIMITING TEMPERATURE

The temperature of an external or internal surface to which the surrounding atmosphere has access, shall not exceed the LIMITING TEMPERATURE specified.

RANGE

It is possible variations will arise in the kW/frame size/rpm, from one manufacturer to another from that normally referred to in normal motor standards.
FANS FOR Ex d AND Ex e APPLICATIONS

Fans for Ex d and Ex e applications, or indeed any hazardous application, can be constructed of special materials and incorporate special features.

Anti-static impellers and earthing leads are just some of the features we can provide.

ELECTRONICALLY COMMUTATED (EC) DC MOTORS

INTRODUCTION

The Electronically Commutated DC motors featured in this catalogue are external-rotor DC motors which are suitable for AC mains supply. These motors have no wear and tear elements such as collectors or carbon brushes which used to be an undesirable component of DC motors and would require regular maintenance. The EC units consist of a brushless DC external-rotor motor with an EC controller that commutates the current in the motor windings electronically. The EC controller monitors the motor and provides interfaces for easy control of the drive. EC motors provide a high level of motor efficiency and carry on-board features that offers almost limitless flexibility in terms of automatic and manual fan speed control.

TEMPERATURE RANGE

These motors are suitable for operating in ambients from -25°C to +60°C.

ENCLOSURE STANDARD

The motor enclosure standard is IP54 in accordance with the appropriate Standards.

ELECTRICAL DETAILS

Motors are suitable for 240V or 415V, 50 or 60Hz supply.

Insulation: Motor insulation is Class F with a 60°C winding temperature rise.

BEARINGS

Motors are fitted with sealed-for-life maintenance free bearings.

PARAMETER SETTINGS

Parameters of the EC fans are programmed in our factory for best possible operation to suit the specific application requirements. It is necessary for the mechanical designer or contractor to provide details as to the application and system control requirements at the time of order.

PROTECTION

The EC motors feature their own integral current overload and over-temperature protection. No other electrical protection is required with these units.
INTRODUCTION

The motors used in the Eco-Speed range of fans deliver the reliability of a 415V three-phase motor using a 240V AC single-phase supply. These patented design motors are the world’s first truly integrated variable frequency drive unit.

The Eco-Speed is an asynchronous motor. They have an integrated variable frequency drive unit and are suitable for infinite speed control without the need for a separate variable speed drive. The motors are suitable for feedback control (constant temperature, pressure, CO, humidity, etc) or some can be manually controlled.

TEMPERATURE RANGE

These motors are suitable for operating in ambients up to 60°C.

ENCLOSURE STANDARD

The motor enclosure standard is IP55 in accordance with the appropriate Standards.

ELECTRICAL DETAILS

Motors are suitable for 240V, 50 or 60Hz supply.
Insulation: Motor winding insulation is Class F.

BEARINGS

Motors are fitted with sealed-for-life maintenance free bearings.

PARAMETER SETTINGS

Parameters of the Eco-Speed fans are programmed in our factory for best possible operation to suit the specific application requirements. It is necessary for the mechanical designer or contractor to provide details as to the application and system control requirements at the time of order.

PROTECTION

The Eco-Speed fans feature their own integral current overload and over-temperature protection. No other electrical protection is required with these units.