CMG

motors

6th Edition

Includes New Models

Meets New Australian Efficiency Standard

SGA™ series motors

Enhanced performance cast iron units

SGAL
Left mounted terminal box

SGA STANDARD MOTOR

SGAT
Top mounted terminal box

SGAB (SGABN)
Brake motors
See page 23

SGAE (SGAN)
Increased safety motors
See page 26

SGAD
Dust excluding ignition proof motors
See page 26

SGAH (SGASS, SGAHS)
High temperature and smokespill motors
See page 24

SGAR
Airstream motors for axial fans
See page 25

SGACT
Cooling tower motors
See page 25

SGAM
Mining specification motors
See page 29

Utilizing our proven enhanced performance SGA motor series, CMG has developed an extensive range with special features to meet the requirements of numerous specific purpose applications. The SGA series from 0.37 to 315kW is part of Australasia's largest range of electric motors. CMG's world best practices and technologies, plus our national computerised sales, spare parts and service back-up mean we can offer a total commitment to every customer. You can be sure every product supplied by CMG's Motors, Transmission or Drives divisions...be it an electric motor, geared motor, variable frequency drive, soft starter, or one of our many other associated products...will perform exactly to specification, and deliver reliable performance year after year with minimum maintenance and downtime.

CMG's Technology division is a recognised R & D leader offering professional engineering staff and NATA accredited laboratory facilities for design, testing, product development and quality control. When you think Motors, Transmission, Drives, or research and development Technology...think CMG.

NATA
Accreditation No. 14396

SGA Enhanced performance cast iron motors Sizes 71 to 355, 0.37 to 315 kW

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Introduction

This catalogue details the complete range of the SGA series motors. Standard SGA motors are three phase squirrel cage TEFC with IEC frame sizes from 71 to 355. They combine high efficiency and excellent electrical characteristics with the robust strength of cast iron.

The standard design includes single speed 2,4,6 and 8 pole as well as a comprehensive selection of 2 speed motors.

In addition to the standard design the range includes:

SGAB – Brake motors
SGAE – Hazardous location Ex 'e'
SGAN – Hazardous location Ex 'n'
SGAD – Hazardous location DIP
SGASS – Smokespill application
SGACT – Cooling tower application
SGAM – Aggressive environment / mining application
SGAR – Airstream rated for Axial flow fans

All units are supplied with Class 'F' insulation, with temperature rise being limited to less than 80K (unless otherwise marked). This provides the end user with a wide safety margin under general operating conditions.

In addition we offer motors wound with H Class insulation, and temperature rise still limited to 80K. Specify:

SGAH – High ambient temperature application
SGAHS – H Class smokespill application

Additional protection is provided by installation of thermistors in all units from SGA 160 frame upward, to continuously protect the winding.

The conservative rating of CMG type SGA motors provides additional operational safeguards, ensures long unit life, and renders this series inherently suitable for most arduous mining, industrial or agricultural applications.

Additionally, optional features are available for selection, which enhance the ability of the SGA motor to cater for severe duty cycles and applications.

Standards and specifications

The main dimensions and rated outputs of CMG type SGA motors generally conform to Australian Standard AS1359 and International Standards IEC60034 and IEC60072.

Compliance with IEC60034 means that many standards from other countries based on IEC60034 can normally be complied with.

SGA MEPS compliance

SGA motor efficiency levels have been determined by test methods to AS/NZS 1359.102.1 and comply to the Minimum Efficiency Requirements as per AS/NZS 1359.5:2000, test method B. Many of the motors in the SGA range actually comply to the high efficiency requirements of the same standard.

Load testing facility

Through our technology division, CMG can offer in-house full load testing of the client's motor. Complete performance tests can be carried out on motors up to 250kW. Tests are conducted in accordance with the relevant Australian Standards.

CMG Technology Laboratory has been NATA accredited since May 2000.

Product code specification

When placing an order, the motor product code should be specified. The product code of the motor is composed in accordance with the following example.

M	3	2	0 0 1 5 0	3	S G A	E
1	2	3	4-8	9	10-12	13-14

Position 1
M = metric frame size

Position 2
Winding design
3 = standard three phase motor
A = 2 speed fan duty single winding
B = 2 speed fan duty separate windings
C = 2 speed constant torque single winding
D = 2 speed constant torque separate windings

Position 3
Number of poles
2 = 2 poles **8** = 8 poles
4 = 4 poles **A** = 10 poles
6 = 6 poles **C** = 12 poles

Position 3 cont.
E = 2/4 poles **M** = 4/12 poles
F = 2/6 poles **N** = 6/8 poles
G = 2/8 poles **O** = 6/10 poles
H = 2/10 poles **P** = 6/12 poles
I = 2/12 poles **Q** = 8/10 poles
J = 4/6 poles **R** = 8/12 poles
K = 4/8 poles **S** = 8/16 poles
L = 4/10 poles

Positions 4 to 8
Rated power output (kW x 100) (refers to high speed for 2 speed motors)

Position 9
Mounting arrangement
1 = V1 **3** = B3
4 = B3/B5 **5** = B5
6 = B3/B14A **7** = B14A
8 = B3/B14B **9** = B14B

Positions 10 to 12
Series
SGA = CMG SGA series

Positions 13 and 14
Variation suffix
No suffix = Standard
1 = high output design
B = Brake motor
BN = Brake - no fan and cowl
CT = Cooling tower
D = DIP
E = Ex e
H = 'H' Class insulation
HS = Smokespill (H Class)
L = LHS terminal box
M = Mining specification
N = Ex n
SS = Smokespill (F Class)
R = Airstream rated
T = Top mount terminal box

Mechanical design

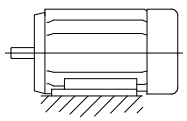
Mountings

CMG SGA Motors are available in the mounting arrangements listed in the table below.

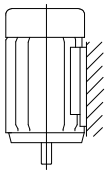
Mounting arrangement		Motor frame													
		71	80	90	100	112	132	160	180	200	225	250	280	315	355
B3	IM1001	•	•	•	•	•	•	•	•	•	•	•	•	•	•
B3/B5	IM2001	•	•	•	•	•	•	•	•	•	•	•	•	•	•
B3/B14	IM2101	•	•	•	•	•	•	•							
B5	IM3001	•	•	•	•	•	•	•	•	•	•	•	•		
B6	IM1051	•	•	•	•	•	•	•	•						
B7	IM1061	•	•	•	•	•	•	•	•						
B8	IM1071	•	•	•	•	•	•	•	•						
B14	IM3601	•	•	•	•	•	•	•							
V1	IM3011	•	•	•	•	•	•	•	•	•	•	•	•	•	•
V1/V5	IM2011	•	•	•	•	•	•	•	•						
V3	IM3031	•	•	•	•	•	•	•	•						
V3/V6	IM2031	•	•	•	•	•	•	•	•						
V5	IM1011	•	•	•	•	•	•	•	•						
V5/V18	IM2111	•	•	•	•	•	•	•							
V6	IM1031	•	•	•	•	•	•	•	•						
V6/V19	IM2131	•	•	•	•	•	•	•							
V18	IM3611	•	•	•	•	•	•	•							
V19	IM3631	•	•	•	•	•	•	•							

Standard mounting arrangements

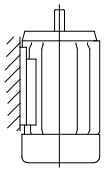
Foot mount



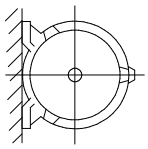
B3 (IM1001)



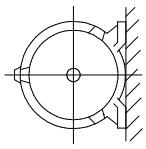
V5 (IM1011)



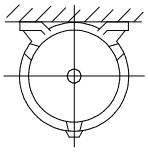
V6 (IM1031)



B6 (IM1051)

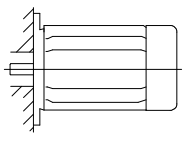


B7 (IM1061)

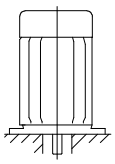


B8 (IM1071)

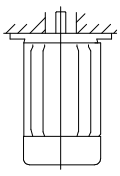
Large flange



B5 (IM3001)

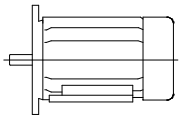


V1 (IM3011)

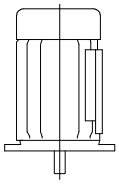


V3 (IM3031)

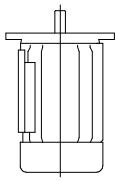
Large flange and feet



B3/B5 (IM2001)

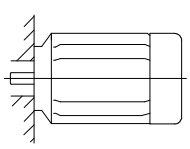


V1/V5 (IM2011)

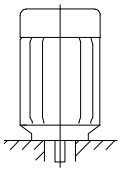


V3/V6 (IM2031)

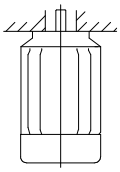
Small flange (face)



B14 (IM3601)

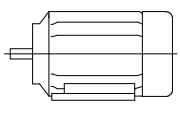


V18 (IM3611)

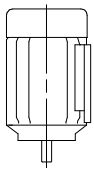


V19 (IM3631)

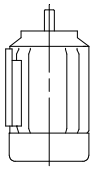
Small flange (face) and feet



B3/B14 (IM2101)



V5/V18 (IM2111)



V6/V19 (IM2131)

Protection

For vertically mounted motors

Motors to be mounted with the shaft vertically up or down, must be provided with a suitable cover (by the installer) to ensure foreign bodies are prevented from entering the motor. Special care is necessary in fitting protective covers to ensure air flow is not impeded.

To maintain IP rating, special additional measures may be required to protect the motor against the ingress of water or foreign bodies. Please contact CMG for advice.

In the case of motors to be mounted with the shaft vertically downwards, the fan cover is not equipped with a protective hood as a standard feature, but is available upon request.

Against solar radiation

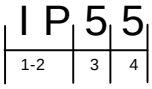
High solar radiation will result in undue temperature rise. In these circumstances motors should be screened from solar radiation by placement of adequate sunshades which do not inhibit air flow.

Degree of protection

Standard levels of enclosure protection for all SGA frame sizes, for both Motor and Terminal box is IP55, with IP56, IP65 and IP66 available on request.

Enclosure designations comply with AS1939-1990 and IEC60529. The enclosure protection required will depend upon the environmental and operational conditions within which the motor is to operate.

IP standards explanation



Positions 1 and 2
International protection rating prefix

Position 3
First characteristic numeral
Degree of protection of persons against approach to live parts or contact with live or moving parts (other than smooth rotating shafts and the like) inside the enclosure, and degree of protection of equipment within the enclosure against the ingress of solid foreign bodies.
4 = *Protected against solid object greater than 1.0 mm:* Wires or strips of thickness greater than 1.0 mm, solid objects exceeding 1.0 mm
5 = *Dust protected:* Ingress of dust is not totally prevented but it does not enter in sufficient quantity to interfere with satisfactory operation of the equipment.
6 = *Dust tight:* No ingress of dust.

Position 4
Secondary characteristic numeral
4 = *Protected against splashing water*: Water splashed against the enclosure from any direction shall have no harmful effect.
5 = *Protected against water jets*: Water projected by a nozzle against the enclosure from any direction shall have no harmful effect.
6 = *Protected against heavy seas*: Water from heavy seas or water projected in powerful jets (larger nozzle and higher pressure than second numeral 5) shall not enter the enclosure in harmful quantities.

Materials and construction

	Motor Frame Size	
Element	71-180	200-355
Frame	Cast Iron	Cast Iron
Endshields	Cast Iron	Cast Iron
Terminal box	Cast Iron	Cast Iron
Fan	Plastic (alloy available) (cast iron available)	Sheet steel blades mounted on cast iron carrier, (all cast iron available)
Fan cowl	Sheet steel	Sheet steel
Fasteners	Corrosion protected	Corrosion protected

Shaft

CMG SGA motors have standard shaft extension lengths and are provided with standard key and drilled and tapped hole. Non standard shaft extensions are available upon special order, with shaft design outlined on a detailed drawing.

Shaft extension run out, concentricity and perpendicularity to face of standard flange mount motors comply with normal grade tolerance as specified in AS1359 and IEC60072-1. Precision grade tolerance is available upon special order.

Finish

Standard CMG SGA motors have a grey paint finish. Other colors are available. All castings and steel parts are provided with a prime coat of rust-resistant paint.

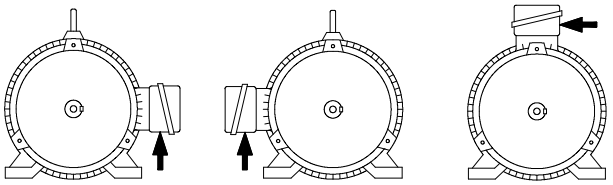
The finishing coat of synthetic paint is sufficient for normal conditions, however special paint systems can be provided to accommodate stringent requirements for motors in corrosive environments. Special coatings are needed to resist such substances as acid, salt water and extreme climatic conditions.

Different colors and paint systems apply for varieties as described later in this catalogue.

Terminal box

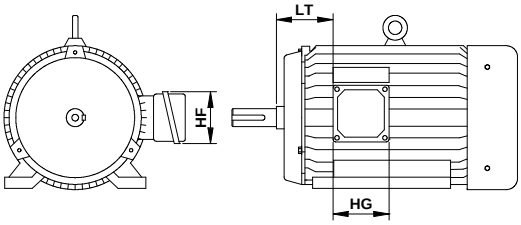
SGA motors have a cast iron terminal box with a one piece neoprene gasket between terminal box and motor, and a flat gasket under the terminal box lid. The earthing stud is mounted within the terminal box.

As standard the terminal box is mounted on the right hand side when viewed from drive end. Motors are also available with terminal boxes on the left hand side or top.



Standard terminal box position | Optional LHS mounting **SGAL** | Optional Top mounting **SGAT**

Conduit entries for motor frame sizes 71 to 280 are provided tapped to Australian standards, with thread details set out below. Motor frame sizes 315 and 355 are provided with a blank removable gland plate for machining as required.



Motor frame	Dimensions HF	HG	LT[1)]	Number of entries	Entry / pitch
71[2)]	125	117	20	2	M20 x 1.5
80	117	125 [3)]	40	2	M20 x 1.5
90S	117	125	45	2	M20 x 1.5
90L	117	125	60	2	M20 x 1.5
100L	125	117	75	2	M20 x 1.5
112M	125	117	80	2	M25 x 1.5
132S	125	117	100	2	M25 x 1.5
132M	125	117	120	2	M25 x 1.5
160M	200	175	65	2	M32 x 1.5
160L	200	175	90	2	M32 x 1.5
180M	200	175	65	2	M40 x 1.5
180L	200	175	65	2	M40 x 1.5
200	240	195	55	2	M50 x 1.5
225	240	195	90	2	M50 x 1.5
250	270	235	95	2	M50 x 1.5
280	270	235	90	2	M50 x 1.5
315	355	300	90	Nil	6 mm Gland plate
355	355	300	125	Nil	6 mm Gland plate

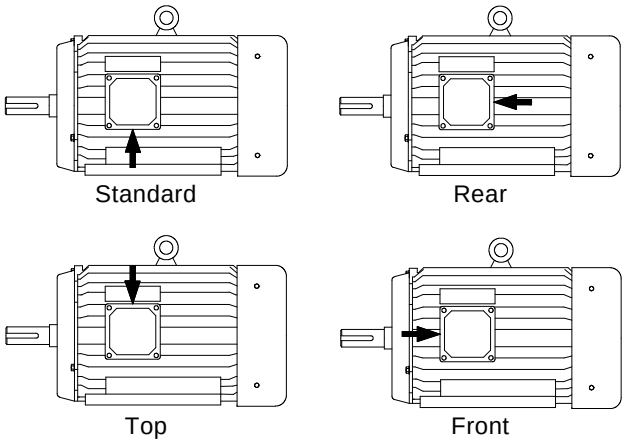
[1)] Dimension LT should be confirmed for SGAL motors.

For details of motors fitted with extended leads refer page 21.

The terminal box can be rotated through 4 positions, 90° apart. Terminal boxes are fitted with conduit entries arranged as follows:

SGA – Standard[2)3)]
SGAR – Rear
SGAT – From RHS when viewed from drive end.

[2)] Frame 71 only available with top mounted terminal box.
[3)] Conduit entry faces to rear of motor for frames 80 & 90.

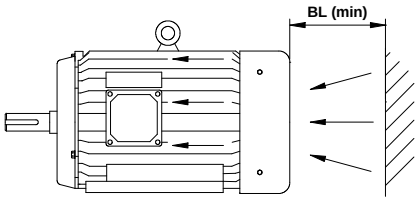


Cooling

CMG SGA motors are totally enclosed fan cooled (TEFC) over an externally ribbed frame, with free movement of internal air by rotation of rotor blades, which is in accordance with AS1359.106 and IC0141 of IEC60034-6.

Cooling air flows from the non-drive-end to the drive end. The fan is independent of the direction of rotation of the motor.

When the motor is installed care should be taken not to impede the air flow into the motor cowl. As a guide the following minimum dimension BL should be adopted.



Motor frame	Dimension BL [mm]
71-100	15
112-132	30
160-180	40
200-280	50
315-355	65

Bearings

As standard, frame sizes 71 to 180 have high quality deep groove ball bearings with full contact seals. Bearings are prepacked with grease which, under normal operating conditions, provide a high degree of operational reliability. Frame sizes 200 to 355 have high quality bearings with facilities to enable replenishment of the lubricant during operation. Grease nipples are fitted to endshields with the grease relief chute blanked off by a removable plate.

The table below sets out the permissible forces that can be applied to the motor shaft. Values assume the occurrence of only radial or axial loading. Point of application of the force is assumed to be at the tip of the shaft. Rotor weights have already been allowed for in the calculation of radial and axial loads. These loads are applicable for horizontal mounting only. The values are calculated on the basis of basic rating life or fatigue life L_{10} of 40,000 hours. Adjusted rating life for specific applications can be calculated if all influencing factors are known.

Greater axial forces can be tolerated if the motors are provided with angular contact ball bearings. Note that in such cases, the axial force must operate in one direction.

High capacity bearings

For frame sizes 200 to 280 in applications with increased radial force, cylindrical roller bearings can be substituted for ball bearings at the drive end, according to the accompanying table. When a roller bearing is fitted to the D-end, the N-end ball bearing is locked with a circlip to prevent axial movement. Note that the use of roller bearings is not recommended for 2 pole motors.

Permissible radial force – high capacity

Motor frame	D-end Roller	N-end Ball	Permissible radial force [N]		
			4 pole	6 pole	8 pole
200	NU312	6312	5825	6730	7455
225	NU313	6313	6015	7055	7740
250	NU314	6314	7295	8420	9315
280	NU317	6317	13445	15320	16770

Lubrication

SGA motors standard bearings are lubricated with lithium based rolling contact bearing grease suitable for operation within the cooling air temperature range of -20°C to +55°C. For operation outside this temperature range special lubricants are required. (For SGAH and SGAHS refer page 24).

Special lubricants or additional maintenance may be required in the case of motors exposed to comparatively high degrees of pollution, high humidity, increased or changed bearings loads, or prolonged continuous operation.

Permissible radial and axial forces – standard B3 mounted motors

Motor frame	Bearing		Permissible radial force [N]				Permissible axial force [N]			
	D-end	N-end	2 pole	4 pole	6 pole	8 pole	2 pole	4 pole	6 pole	8 pole
71	6202-2RS	6202-2RS	320	380	-	-	235	320	-	-
80	6204-2RS	6204-2RS	465	595	685	-	395	540	650	-
90	6205-2RS	6205-2RS	490	620	720	-	415	570	685	-
100	6206-2RS	6206-2RS	700	885	1030	1140	570	775	940	1075
112	6306-2RS	6306-2RS	960	1230	1415	1575	785	1080	1305	1515
132	6308-2RS	6308-2RS	1410	1815	2095	2320	1160	1590	1910	2200
160	6309-2RS	6309-2RS	1825	2345	2710	3020	1470	2030	2450	2800
180	6311-2RS	6311-2RS	2495	3200	3765	4200	1985	2700	3265	3755
200	6312	6312	2905	3745	4345	4825	2220	3055	3705	4225
225	6313	6313	3265	4010	4725	5205	2460	3385	4120	4730
250	6314	6314	3570	4635	5370	5960	2730	3775	4560	5220
280-2	6314	6314	3455				2605			
280-4,6,8	6317	6317		8170	9360	10270		4560	5580	6365
315-2	6316	6316	3550				2730			
315-4,6,8	NU319	6319		15720	17925	19660		4835	5890	6770
355-2	6317	6317	3760				2875			
355-4,6,8	NU322	6322		22125	25350	27860		6115	7390	8530

Vibration, balancing and noise

Vibration

SGA motors fall within the limits of vibration severity set out in Australian Standards AS1359.114-1997, which are listed below. Level N (normal) values relate to rotating machinery measured in soft suspension.

Vibration severity limit

Motor frame	Maximum RMS vibration velocity [mm/s]
71	1.8
80	1.8
90	1.8
100	1.8
112	1.8
132	1.8
160	2.8
180	2.8
200	2.8
225	2.8
250	3.5
280	3.5
315	3.5
355	3.5

Balancing

Rotors have been dynamically balanced with a half key to the vibration tolerances specified above. Pulleys or couplings used with motors must also be appropriately balanced.

Noise

Noise levels for CMG SGA motors comply with limits set by AS1359.109-1998/IEC 60034.9-1997. SGA sound pressure levels at 1 metre are set out in the table to the right.

Sound pressure level

Output (kW)	SGA sound pressure level dB(A) at 1 metre			
	3000 r/min	1500 r/min	1000 r/min	750 r/min
0.37	-	61	57	-
0.55	-	61	57	-
0.75	65	61	59	-
1.1	65	61	60	56
1.5	69	61	60	56
2.2	69	63	60	56
3	72	63	64	59
4	72	67	64	59
5.5	76	68	68	65
7.5	76	71	68	65
11	80	72	70	65
15	80	74	70	57
18.5	80	74	70	57
22	85	74	70	57
30	87	76	73	70
37	87	76	73	70
45	89	76	76	70
55	89	78	76	74
75	91	81	78	76
90	91	81	78	76
110	92	84	79	76
132	92	86	80	77
160	92	87	85	82
200	92	89	85	82
220	95	92	88	-
250	95	92	88	-
315	95	92	-	-

Electrical design

CMG SGA standard motors have the following design and operating parameters. Performance data is based on this standard. Any deviation should be examined and performance values altered in accordance with the information provided in this section.

Three phase, 415 Volts, 50 Hz
Ambient cooling air temperature – 40°C
Altitude – 1000 m
Duty cycle – S1 (continuous)
Rotation – Clockwise viewed from drive end
Connection – 240 volt Delta/415 volt Star (3kW and below)
415 volt Delta/720 volt Star (4kW and above)

Voltage and frequency

Standard SGA motors are designed for a power supply of three phase 415 Volts, 50 Hz. Motors can be manufactured for any supply between 100 and 1000 volts and frequencies other than 50 Hz.

Standard SGA motors may operate when connected to certain other non-standard voltages and frequencies. The accompanying table covers some common non-standard voltages and frequencies. Rated performance data values should be multiplied by the factors to give more realistic operating data values which, if used, will reduce additional motor temperature rise.

Supply [Volts / Hz]	Rated speed	Rated power	Rated current I_N	Rated torque T_N	Locked rotor torque T_L	Breakdown torque T_B
380/50	1.00	0.90	1.00	0.90	0.83	0.83
415/50	1.00	1.00	1.00	1.00	1.00	1.00
440/50	1.00	1.00	1.00	1.00	1.10	1.10
415/60	1.20	1.00	1.00	0.83	0.69	0.69
440/60	1.20	1.05	1.00	0.87	0.77	0.77
460/60	1.20	1.10	1.00	0.91	0.85	0.85
480/60	1.20	1.15	1.00	0.96	0.92	0.92

For critical applications data should be confirmed.

Standard torque values for alternative supplies are obtainable only with special windings. For these purpose-built motors the performance data is the same as for 415 volt motors except for the currents which are calculated with the accompanying formula.

$$I_X = \frac{415 \times I_N}{U_X}$$

Where:
I_X = Current
I_N = Rated current at 415 volt
U_X = design voltage

Temperature and altitude

Rated and output power specified in the performance data tables apply for standard ambient conditions of 40°C at 1000 m above sea level. Where temperature or altitude differ from the standard, multiplication factors in the table below should be used.

Ambient temperature	Temperature Factor
30°C	1.06
35°C	1.03
40°C	1.00
45°C	0.97
50°C	0.93
55°C	0.88
60°C	0.82

Altitude above sea level	Altitude Factor
1000 m	1.00
1500 m	0.98
2000 m	0.94
2500 m	0.91
3000 m	0.87
3500 m	0.82
4000 m	0.77

Effective Power **=** ***Rated Power*** **x** ***Temperature Factor*** **x** ***Altitude Factor***

Example 1
Effective Power required 15 kW
Air temperature 50°C (factor 0.93)
Altitude 2500 metres (factor 0.91)

$$\textit{Rated power required} = \frac{15}{0.93 \times 0.91} = 17.7\ kW$$

The appropriate motor is one with a rated power above the required, being 18.5 kW.

Example 2
Rated power 11 kW
Air temperature 50°C (factor 0.93)
Altitude 1500 meters (factor 0.98)

Effective Power = 11 x 0.93 x 0.98 = 10.0 kW

Rotation

For clockwise rotation, viewed from drive end, standard three phase **SGA** and **SGAT** motor terminal markings coincide with the sequence of the phase line conductors.

For counter clockwise rotation, viewed from drive end, two of the line conductors have to be reversed. This is made clear in the accompanying table.

Non-standard **SGAL** series motors with the terminal box located on the left, viewed from drive end, have a counter-clockwise rotation for corresponding markings. Reversing two of the line conductors will reverse the rotation to clockwise.

Terminal box location (viewed from drive end)	Sequential connection of L1 L2 and L3	Direction of rotation
Right or Top	U1 V1 W1	Clockwise
	V1 U1 W1	Counter-clockwise
Left	V1 U1 W1	Clockwise
	U1 V1 W1	Counter-clockwise

Duty

SGA motors are supplied suitable for S1 operation (continuous operation under rated load). When the motor is to operate under any other type of duty the following information should be supplied to determine the correct motor size.

- Type and frequency of switching cycles as per duty factors S3 to S7 and duty cycle factor.
- Load torque variation during motor acceleration and braking (in graphical form).
- Moment of inertia of the load on the motor shaft.
- Type of braking (eg mechanical, electrical through phase reversal or DC injection.)

Permissible output

Apply the factors in the accompanying table to the output rating for motors with duty cycles that are not continuous.

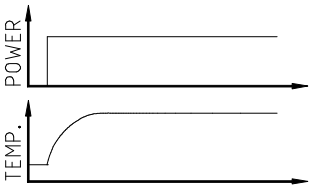
		Duty cycle factor		
	Poles	For frames 80 to 132	For frames 160 to 250	For frames 280 to 355
Short-time duty, S2				
30 min	2	1.05	1.20	1.20
	4 to 8	1.10	1.20	1.20
60 min	2 to 8	1.00	1.10	1.10
Intermittent duty, S3				
15%	2	1.15	1.45	1.40
	4 to 8	1.40	1.40	1.40
25%	2	1.10	1.30	1.30
	4 to 8	1.30	1.25	1.30
40%	2	1.10	1.10	1.20
	4 to 8	1.20	1.08	1.20
60%	2	1.05	1.07	1.10
	4 to 8	1.10	1.05	1.10

For other duties S4, S5, S6 and S7 contact CMG for appropriate Duty cycle factors.

Duty cycles

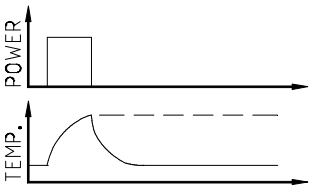
S1 Continuous duty

Operation at constant load of sufficient duration for thermal equilibrium to be reached.



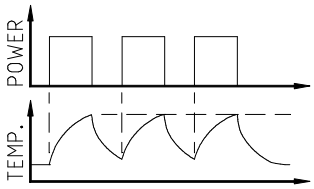
S2 Short – time Duty

Operation at constant load during a given time, less than that required to reach thermal equilibrium, followed by a rest (de-energised) period of sufficient duration to allow machine temperatures to reduce to within 2K of the rated inlet coolant temperature.



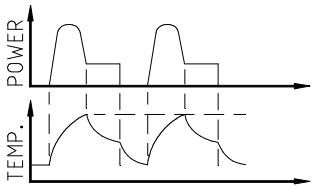
S3 Intermittent periodic Duty with insignificant starting time

A sequence of identical duty cycles where each consists of a period of operating at constant load and a period at rest. The cycle is such that the starting current does not significantly affect the temperature rise.



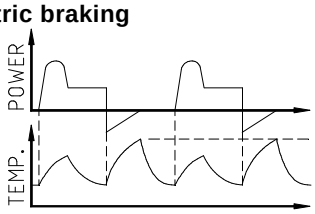
S4 Intermittent Periodic duty with significant starting time

Sequence of identical duty cycles where each cycle consists of a significant period of starting, a period of operation at full load and a period of rest.



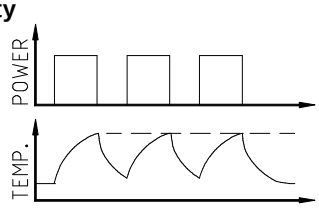
S5 Intermittent periodic duty with influence of running up period and electric braking

As S4, but with each cycle including a period of rapid electric braking.



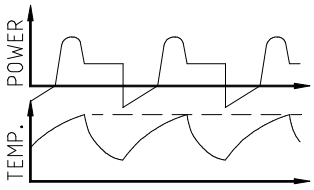
S6 Continuous periodic duty

A sequence of identical duty cycles, each cycle consisting of a period of operation at no-load. There is no rest or de-energised period.



S7 Continuous periodic duty with starting and electric braking

As S6, with each cycle including a period of starting and a period of electric braking.



Connection

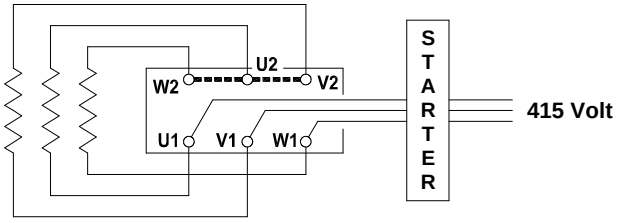
A motor's rated voltage must agree with the power supply line-to-line voltage. Care must therefore be taken to ensure the correct connection to the motor terminals.

Internal connections, Voltages and VF drive selection.

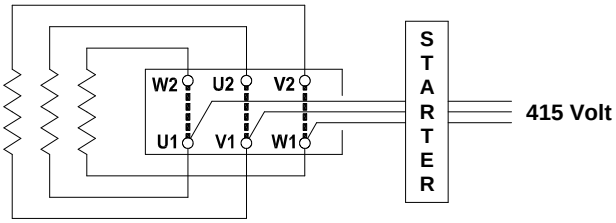
Standard terminal connections for motors 3.0 kW and below is 240 volt delta / 415 volt star. These motors are designed for 415 volt Direct On Line (D.O.L.) starting, when connected in the star configuration. They are also suitable for operation with 240 volt three phase variable frequency drives, when connected in the delta configuration.

Standard terminal connections for motors 4.0 kW and above is 415 volt delta / 720 volt star. These motors are designed for 415 volt Direct On Line (D.O.L.) starting, when connected in the delta configuration. They are also suitable for operation with 415 volt three phase variable frequency drives. Alternatively they can be operated D.O.L. in the star configuration from a 720 volt supply or with a 720 volt variable frequency drive. In this case the drive must be supplied with an output reactor to protect the winding insulation. These size motors are also suitable for 415 volt star-delta starting as described below.

Motor connected for D.O.L. starting
with bridges in place for star connection
(3.0kW and below)



Motor connected for D.O.L. starting
with bridges in place for delta connection
(4.0kW and above)



Starting

All of the following starter options are available through CMG Drives division, and are best supplied together with the motor.

D.O.L. Starters

When an electric motor is started by direct connection to the power supply (D.O.L.), it draws a high current, called the 'starting current', which is approximately equal in magnitude to the locked rotor current I_L. As listed in the performance data locked rotor current can be up to 8 times the rated current I_N of the motor. In circumstances where the motor starts under no load or where high starting toque is not required, it is preferable to reduce the starting current by one of the following means.

Star - Delta starting

SGA Motors 4.0 kW and above are suitable for the star-delta starting method. Through the use of a star-delta starter, the motor terminals are connected in the star configuration during starting, and reconnected to the delta configuration when running. The benefits of this starting method are a significantly lower starting current, to a value about $^1/_3$ of the D.O.L. starting current, and a corresponding starting torque also reduced to about $^1/_3$ of its D.O.L. value. It should be noted that a second current surge occurs on changeover to the delta connection. The level of this surge will depend on the speed the motor has reached at the moment of changeover.

Electronic soft starters

Through the use of an electronic soft starter, which controls such parameters as current and voltage, the starting sequence can be totally controlled. The starter can be programmed to limit the amount of starting current and by limiting the rate of the current increase the startup time is extended. Where large inertial loads are to be started it is especially important to extend this startup time.

VVVF Drives

Variable voltage, variable frequency drives are primarily recognized for their ability to manipulate power from a constant 3 phase 50 Hz power supply converting it to variable voltage and variable frequency power. This enables the speed of motor to be matched to its load in a flexible and energy efficient manner. The only way of producing starting torque equal to full load torque with full load current is by using VVVF drives. The functionally flexible VVVF drive is also commonly used to reduce energy consumption on fans, pumps and compressors and offer a simple and repeatable method of changing speeds or flow rates.

Insulation

Standard SGA series motors are wound with Class F insulation and winding designs limit the temperature rise to 80K (unless otherwise noted) for which Class B insulation would normally be sufficient. The use of Class F insulation provides an additional safety margin of 25K, as shown in the accompanying table, together with an extended operating life.

The **SGAH** version will provide a safety margin of 45K and can be safely operated at elevated ambient temperatures.

Due to their conservative design many sizes in the SGA range of motors have temperature rises considerably less than 80K and therefore provide even greater safety margins.

	Insulation class		
	B	F	H
Max. permissible winding temp. (°C)	130	155	180
Less ambient temp. (°C)	- 40	- 40	- 40
Less hotspot allowance (K)	- 10	- 10	- 15
Equals **max. permissible temp.rise** (K)	80	105	125
Less max. design temp. rise (K)	- 80	- 80	- 80
Equals **min. safety margin (K)**	--	25	45

Torque characteristics

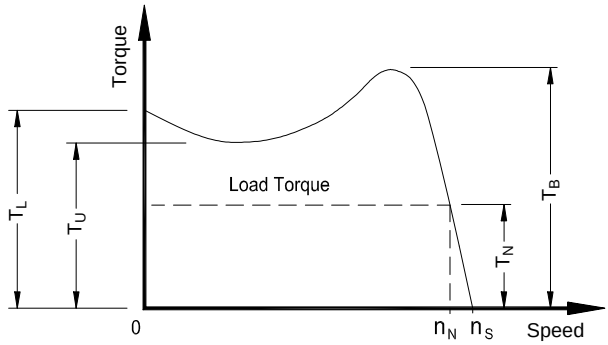
Typical characteristics of torque behavior relative to speed are shown in the torque speed curve example below.

CMG SGA motors all exceed the minimum starting torque requirements for Design N (Normal torque) as specified in AS1359.41-1986, and in most cases meet the requirements of Design H (High torque).

Rated torque can be calculated with the following formula.

$$T_N = \frac{9550 \times P_N}{n_N}$$

Where:
T_N = rated torque (Nm)
P_N = rated power (kW)
n_N = rated speed (r/min)



T_N - rated torque
T_L - starting torque
T_U - pull-up torque
T_B - brake down torque
n_N - rated speed
n_S - synchronous (no load) speed

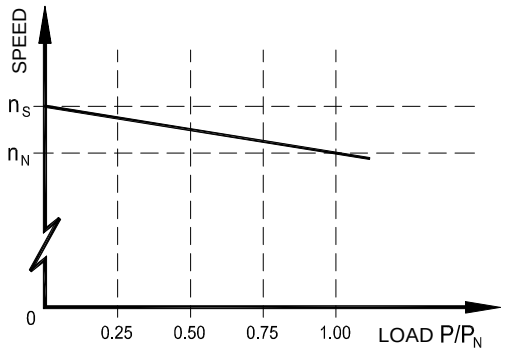
Thermal protection

Motors can be protected against excessive temperature rise by inserting, at various positions within the windings, thermal probes which can either give a warning signal or cut off the supply to the motor in the event of a temperature abnormality.

The units fitted to SGA motors, frame sizes 160 and above, are PTC thermistors. These thermovariable resistors, with positive temperature co-efficient, are fitted one per phase, series connected and are terminated in a terminal strip located in the terminal box. Trip temperature is 160°C. (180°C for SGAH series.) Additional 130°C thermistors can be fitted as an option for alarm connection.

Speed at partial loads

The relationship between motor speed and degree of loading on an SGA motor is approximately linear up to the rated load. This is expressed graphically in the accompanying drawing.



n_N - rated speed
n_S - synchronous (no load) speed
P/P_N - partial load factor

Performance data

SGA series 415V 50Hz
IP55 Insulation class F, Temperature rise class B

kW	Motor frame	Speed [r/min]	Efficiency [%] at % full load 125	**100**	75	50	Power factor, cos φ at % full load 125	**100**	75	50	Current Full load I_N [A]	Locked rotor I_L/I_N	t_E time[2] [sec]	Torque Full load T_N [Nm]	Locked rotor T_L/T_N	Break down T_B/T_N	Moment of inertia J=¼GD² [kg·m²]	Weight of foot mount motor [kg]
3000 r/min = 2 poles																		
0.75	**80 A**	2815	75.3	**76.2**	75.7	72.3	0.88	**0.83**	0.78	0.67	1.7	5.9	17	2.5	2.8	3.6	0.00075	16
1.1	**80 B**	2830	77.5	**79.3**	80.0	78.2	0.89	**0.84**	0.82	0.72	2.3	6.0	11	3.7	2.6	2.9	0.0009	17
1.5	**90 S**	2850	79.3	**80.4**	80.2	77.3	0.88	**0.84**	0.80	0.70	3.1	6.5	11	5.0	2.8	3.3	0.0012	22
2.2	**90 L**	2830	79.4	**81.6**	82.7	81.6	0.90	**0.87**	0.84	0.74	4.3	6.4	6	7.4	2.8	2.8	0.0014	24
3.0	**100 L**	2870	82.1	**83.4**	83.4	81.3	0.90	**0.88**	0.85	0.76	5.7	7.5	7	10.0	2.8	3.3	0.0029	36
4.0	**112 M**	2895	85.2	**85.5**	85.5	83.5	0.90	**0.89**	0.85	0.76	7.3	8.0	7	13.2	2.7	3.4	0.0055	41
5.5	**132 SA**	2910	85.7	**85.7**	84.5	81.5	0.92	**0.88**	0.88	0.82	10.1	7.4	11	18.1	2.2	3.2	0.0109	64
7.5	**132 SB**	2895	85.9	**87.0**	86.9	85.3	0.91	**0.90**	0.89	0.84	13.3	7.2	7	24.7	2.2	2.8	0.0126	68
11	**160 MA**	2935	88.4	**88.4**	87.4	85.3	0.89	**0.89**	0.87	0.83	19.5	7.1	25	35.8	2.2	2.9	0.0377	117
15	**160 MB**	2930	88.8	**89.4**	88.5	86.2	0.90	**0.89**	0.88	0.83	26.1	6.9	14	48.9	2.1	2.8	0.0499	125
18.5	**160 L**	2930	90.2	**90.5**	90.2	88.6	0.91	**0.91**	0.90	0.87	31.3	7.3	10	60.3	2.3	3.0	0.055	147
22	**180 M**	2930	90.4	**90.5**	89.9	87.7	0.92	**0.90**	0.89	0.85	37.7	7.1	7	71.7	2.3	2.9	0.075	180
30	**200 LA**	2955	91.4	**91.4**	90.3	87.7	0.88	**0.85**	0.83	0.75	53.5	8.3	12	97	2.5	3.3	0.124	240
37	**200 LB**	2955	92.0	**92.0**	91.2	89.3	0.90	**0.89**	0.87	0.81	63	8.1	6	120	2.8	3.1	0.139	260
45	**225 M**	2970	93.5	**92.5**	90.9	88.4	0.89	**0.89**	0.88	0.84	76	7.6	7	145	2.0	2.9	0.233	325
55	**250 M**	2975	93.4	**93.0**	91.9	89.2	0.88	**0.86**	0.84	0.78	96	7.6	8	177	2.4	3.2	0.312	405
75	**280 S**	2970	93.1	**93.6**	93.1	91.5	0.89	**0.90**	0.88	0.84	124	6.1	• [3]	241	2.1	3.0	0.597	550
90	**280 M**	2980	94.1	**94.1**	93.1	92.1	0.89	**0.90**	0.87	0.85	148	7.4	• [3]	288	2.6	3.1	0.675	610
110	**315 S**	2980	93.9	**94.4**	93.9	92.4	0.90	**0.90**	0.87	0.82	181	7.6	• [3]	353	2.5	3.0	1.18	980
132	**315 MA**	2980	93.8	**94.8**	94.3	92.8	0.88	**0.88**	0.85	0.80	220	7.0	• [3]	423	2.3	2.9	1.82	1080
160	**315 LA**	2980	94.5	**95.0**	94.5	93.0	0.91	**0.91**	0.88	0.82	259	7.4	• [3]	513	2.5	2.9	2.08	1160
200	**315 LB**	2980	94.5	**95.0**	94.5	93.0	0.91	**0.90**	0.88	0.82	324	7.4	• [3]	641	2.5	2.9	2.38	1210
220[1]	**315 LC**	2980	94.0	**95.0**	94.5	93.5	0.90	**0.90**	0.89	0.83	357	6.7	-	705	2.3	2.6	2.45	1250
250[1]	**355 MB**	2985	94.5	**95.0**	94.0	92.5	0.90	**0.90**	0.88	0.81	407	6.8	-	800	1.7	3.1	3.00	1770
315[1]	**355 LB**	2985	95.2	**95.2**	95.2	94.0	0.91	**0.91**	0.89	0.81	506	6.8	-	1008	1.7	3.0	3.50	1900
3000 r/min = 2 poles – High Output Design[4]																		
5.5[1)5)]	**112 MB**	2855	82.0	**83.5**	83.6	81.6	0.90	**0.88**	0.84	0.74	10.4	6.8	-	18.4	2.5	3.0	0.0063	44
11[1)5)]	**132 MB**	2865	85.0	**86.5**	86.9	85.8	0.92	**0.91**	0.90	0.85	19.4	6.9	-	36.7	2.3	2.9	0.0145	74
75[1]	**250 MB**	2960	93.7	**93.8**	93.7	92.5	0.90	**0.90**	0.89	0.86	123	6.1	-	242	2.0	2.3	0.426	430
110[1]	**280 MB**	2975	94.3	**94.4**	93.4	91.7	0.89	**0.89**	0.86	0.81	183	7.5	-	353	2.9	3.4	0.825	670

This data is provided for guidance only. Results are guaranteed only when confirmed by test results.

[1] Class F temperature rise

[2] t_E time applies to Ex e motors only and is explained in the hazardous areas section.

[3] SGAE motors from 75 to 200 kW 2 pole are under development.

[4] High Output design. The output of these motors is one step higher than the basic design with rated outputs in accordance with CENELEC. (Product code: M32••••••SGA1.)

[5] Do not currently meet MEPS requirements.

SGA series 415V 50Hz
IP55 Insulation class F, Temperature rise class B

kW	Motor frame	Speed [r/min]	Efficiency [%] at % full load 125	**100**	75	50	Power factor, cos φ at % full load 125	**100**	75	50	Current Full load I_N [A]	Locked rotor I_L/I_N	t_E time[2] [sec]	Torque Full load T_N [Nm]	Locked rotor T_L/T_N	Break down T_B/T_N	Moment of inertia J=¼GD² [kg·m²]	Weight of foot mount motor [kg]
1500 r/min = 4 poles																		
0.37	**71 B**	1345	65.2	**69.3**	71.0	68.4	0.81	**0.76**	0.65	0.52	1.0	4.1	35	2.6	2.2	2.2	0.0008	11
0.55	**80 A**	1390	71.8	**72.8**	72.6	69.0	0.80	**0.75**	0.66	0.55	1.4	4.8	25	3.8	2.5	2.6	0.0018	17
0.75	**80 B**	1390	72.6	**74.4**	74.2	70.0	0.79	**0.74**	0.65	0.54	1.9	4.6	18	5.2	2.5	2.6	0.0021	17
1.1	**90 S**	1410	75.3	**77.4**	77.8	75.0	0.83	**0.79**	0.70	0.57	2.5	5.4	10	7.5	2.8	2.9	0.0023	20
1.5	**90 L**	1390	76.0	**78.5**	78.1	76.7	0.85	**0.81**	0.75	0.64	3.3	5.3	8	10.3	2.7	2.8	0.0027	26
2.2	**100 LA**	1430	81.6	**82.5**	83.0	81.1	0.86	**0.82**	0.76	0.65	4.5	6.7	11	14.7	2.8	3.3	0.0054	35
3	**100 LB**	1420	81.1	**82.6**	83.2	81.6	0.87	**0.86**	0.78	0.66	5.9	6.7	7	20.2	2.9	2.9	0.0067	36
4	**112 M**	1440	84.1	**85.0**	84.8	82.7	0.86	**0.83**	0.76	0.64	7.9	7.6	7	26.5	3.1	3.5	0.0095	49
5.5	**132 S**	1450	85.7	**86.7**	86.8	85.6	0.87	**0.87**	0.81	0.71	10.2	6.9	11	36.2	2.3	3.0	0.0214	63
7.5	**132 M**	1450	86.8	**87.9**	88.2	87.2	0.88	**0.87**	0.83	0.74	13.7	7.5	9	50.0	2.6	2.9	0.0296	76
11	**160 M**	1460	88.4	**89.2**	89.2	87.8	0.86	**0.85**	0.83	0.75	20.1	6.8	12	72	2.0	2.8	0.0747	123
15	**160 L**	1460	88.4	**89.7**	89.7	88.4	0.86	**0.85**	0.82	0.75	27.3	7.1	10	98	2.3	2.9	0.0918	144
18.5	**180 M**	1470	90.2	**90.7**	90.6	89.2	0.90	**0.89**	0.86	0.77	32	7.0	17	120	2.1	3.1	0.139	182
22	**180 L**	1470	91.0	**91.6**	91.7	90.7	0.90	**0.88**	0.85	0.75	38	7.6	14	143	2.2	3.6	0.158	190
30	**200 L**	1475	92.0	**92.6**	92.4	91.6	0.89	**0.87**	0.84	0.75	52	7.6	10	194	2.4	3.1	0.262	260
37	**225 S**	1480	92.6	**92.8**	92.7	91.5	0.88	**0.87**	0.84	0.75	64	7.4	7	239	2.2	2.9	0.406	310
45	**225 M**	1480	92.7	**93.4**	93.3	92.5	0.90	**0.89**	0.87	0.81	75	7.4	7	291	2.1	2.9	0.469	388
55	**250 M**	1480	93.6	**94.0**	94.2	93.6	0.91	**0.89**	0.88	0.82	91	7.5	8	355	2.6	3.1	0.66	405
75	**280 S**	1480	93.7	**94.0**	93.5	92.0	0.91	**0.91**	0.89	0.84	122	6.7	• [3]	484	2.1	3.2	1.12	565
90	**280 M**	1485	93.9	**94.0**	93.5	91.8	0.89	**0.88**	0.86	0.80	152	6.7	• [3]	579	2.4	3.3	1.46	662
110	**315 S**	1485	94.7	**94.4**	93.5	91.4	0.88	**0.88**	0.87	0.81	184	6.0	• [3]	707	1.9	2.8	3.11	1000
132	**315 MA**	1485	94.8	**94.8**	94.8	93.3	0.91	**0.91**	0.88	0.82	213	6.0	• [3]	849	2.3	2.7	3.62	1100
160	**315 LA**	1485	94.5	**95.0**	94.5	93.5	0.88	**0.88**	0.85	0.78	265	6.7	• [3]	1029	2.2	2.9	4.13	1140
200	**315 LB**	1485	94.6	**95.0**	94.1	92.7	0.90	**0.89**	0.87	0.81	329	7.6	• [3]	1286	2.6	3.2	4.73	1225
220[1]	**315 LC**	1485	94.0	**95.0**	94.1	92.6	0.90	**0.91**	0.89	0.83	356	6.9	-	1415	2.4	2.9	4.8	1230
250	**355 MB**	1485	95.0	**95.0**	94.4	93.4	0.88	**0.89**	0.87	0.79	411	6.3	-	1608	1.7	3.0	6.5	1800
315[1]	**355 LB**	1489	95.5	**95.5**	95.0	93.8	0.87	**0.88**	0.86	0.79	524	6.5	-	2020	1.7	2.9	8.2	1940
1500 r/min = 4 poles – High Output Design[4]																		
11[1) 5)]	**132 MB**	1435	84.8	**86.2**	86.4	85.1	0.89	**0.88**	0.84	0.75	20.3	7.0	-	73	2.1	2.3	0.0344	81
75[1)]	**250 MB**	1480	94.4	**94.9**	95.2	94.8	0.89	**0.89**	0.86	0.79	123	7.0	-	484	2.0	2.4	0.90	450
110[1)]	**280 MB**	1485	94.2	**94.4**	94.2	92.8	0.90	**0.90**	0.87	0.80	180	6.5	-	707	1.9	2.6	1.78	720

This data is provided for guidance only. Results are guaranteed only when confirmed by test results.

[1] Class F temperature rise.

[2] t_E time applies to Ex e motors only and is explained in the hazardous areas section.

[3] SGAE motors from 75 to 200 kW 4 pole are under development.

[4] High Output design. The output of these motors is one step higher than the basic design with rated outputs in accordance with CENELEC. (Product code: M34••••••SGA1.)

[5] Do not currently meet MEPS requirements.

SGA series 415V 50Hz
IP55 Insulation class F, Temperature rise class B

kW	Motor frame	Speed [r/min]	Efficiency [%] at % full load 125	**100**	75	50	Power factor, cos φ at % full load 125	**100**	75	50	Current Full load I_N [A]	Locked rotor I_L/I_N	t_E time[2] [sec]	Torque Full load T_N [Nm]	Locked rotor T_L/T_N	Break down T_B/T_N	Moment of inertia J=¼GD² [kg·m²]	Weight of foot mount motor [kg]
1000 r/min = 6 poles																		
0.37	**80 A**	915	59.6	**66.5**	67.7	64.2	0.77	**0.70**	0.62	0.49	1.1	2.8	65	3.9	1.6	1.7	0.0016	16
0.55	**80 B**	910	64.5	**68.2**	68.4	64.1	0.75	**0.66**	0.59	0.47	1.7	3.1	35	5.8	1.7	2.0	0.0019	16
0.75	**90 S**	930	72.8	**74.4**	73.9	70.6	0.79	**0.74**	0.64	0.52	1.9	4.6	30	7.7	2.4	2.6	0.0029	21
1.1	**90 L**	920	71.8	**75.2**	74.7	72.1	0.80	**0.75**	0.66	0.53	2.7	4.5	14	11.4	2.4	2.4	0.0035	24
1.5	**100 L**	945	76.0	**77.6**	77.6	74.8	0.80	**0.73**	0.66	0.54	3.7	5.1	8	15.2	2.2	2.9	0.0069	32
2.2	**112 M**	945	78.6	**79.9**	79.9	76.7	0.78	**0.75**	0.66	0.52	5.1	5.6	12	22.2	2.7	2.8	0.014	40
3	**132 S**	970	83.7	**84.5**	84.6	82.0	0.82	**0.77**	0.71	0.57	6.4	6.7	12	30	2.3	3.2	0.0286	60
4	**132 MA**	965	83.8	**84.6**	84.7	82.6	0.81	**0.77**	0.70	0.58	8.5	6.8	9	40	2.5	3.1	0.0357	70
5.5	**132 MB**	960	84.6	**85.7**	86.0	84.4	0.84	**0.81**	0.76	0.64	11.0	6.9	9	55	2.4	3.0	0.0449	80
7.5	**160 M**	970	86.0	**87.0**	87.0	85.5	0.79	**0.76**	0.71	0.60	15.8	5.5	18	74	2.0	2.6	0.0881	130
11	**160 L**	970	88.4	**89.0**	89.5	89.0	0.83	**0.78**	0.73	0.64	22	6.3	16	108	2.1	2.5	0.116	147
15	**180 L**	970	88.3	**89.1**	89.1	87.8	0.86	**0.84**	0.79	0.70	28	6.0	20	148	2.0	2.7	0.207	195
18.5	**200 LA**	980	89.4	**90.0**	90.2	88.9	0.86	**0.82**	0.78	0.67	35	6.8	12	180	2.1	3.3	0.315	225
22	**200 LB**	980	89.5	**90.1**	90.1	88.6	0.86	**0.83**	0.78	0.67	41	7.0	10	214	2.3	3.5	0.36	255
30	**225 M**	985	91.3	**91.8**	91.5	90.2	0.84	**0.83**	0.79	0.71	55	7.0	16	290	2.1	3.0	0.547	297
37	**250 M**	985	92.6	**92.9**	92.8	91.8	0.89	**0.88**	0.86	0.79	63	7.5	15	358	2.2	3.0	0.834	413
45	**280 S**	985	92.5	**93.0**	92.5	91.5	0.86	**0.86**	0.83	0.76	78	6.4	• [3]	436	1.9	3.1	1.39	536
55	**280 M**	985	92.5	**93.0**	92.5	91.5	0.87	**0.87**	0.85	0.77	95	6.4	• [3]	533	2.0	3.2	1.65	595
75	**315 S**	990	93.5	**94.0**	93.5	92.0	0.87	**0.88**	0.85	0.78	126	6.3	• [3]	723	1.8	2.9	4.11	990
90	**315 MA**	990	94.0	**94.0**	93.5	92.0	0.88	**0.88**	0.85	0.78	151	6.2	• [3]	873	1.7	2.8	4.78	1080
110	**315 LA**	990	94.1	**94.3**	93.9	92.5	0.86	**0.86**	0.84	0.77	189	6.5	• [3]	1061	1.9	3.1	5.45	1150
132	**315 LB**	990	94.5	**94.7**	94.2	93.0	0.86	**0.86**	0.84	0.77	226	6.6	• [3]	1273	1.9	3.1	6.12	1210
160[1]	**355 MA**	990	94.1	**94.9**	94.2	93.0	0.87	**0.87**	0.87	0.82	270	6.7	-	1543	1.8	2.4	9.5	1590
200[1]	**355 MC**	985	94.7	**94.9**	94.5	93.7	0.89	**0.89**	0.87	0.83	330	6.3	-	1939	2.0	2.5	10.4	1760
250[1]	**355 LB**	990	95.0	**95.0**	95.0	94.0	0.88	**0.88**	0.86	0.80	416	6.4	-	2412	1.9	2.4	12.4	1990

This data is provided for guidance only. Results are guaranteed only when confirmed by test results.

[1] Class F temperature rise

[2] t_E time applies to Ex e motors only and is explained in the hazardous areas section.

[3] SGAE motors from 45 to 132 kW 6 pole are under development.

SGA series 415V 50Hz
IP55 Insulation class F, Temperature rise class B

kW	Motor frame	Speed [r/min]	Efficiency % at % full load 125	**100**	75	50	Power factor, cos φ at % full load 125	**100**	75	50	Current Full load I_N [A]	Locked rotor I_L/I_N	t_E time[2] [sec]	Torque Full load T_N [Nm]	Locked rotor T_L/T_N	Break down T_B/T_N	Moment of inertia J=¼GD² [kg·m²]	Weight of foot mount motor [kg]
750 r/min = 8 poles																		
1.1	**100 LB**	710	71.5	**72.1**	70.5	64.7	0.71	**0.62**	0.54	0.42	3.4	4.2	16	14.8	2.3	2.8	0.011	33
1.5	**112 M**	700	75.2	**77.2**	77.3	74.5	0.75	**0.69**	0.60	0.48	3.9	4.5	25	20.5	2.0	2.5	0.0245	45
2.2	**132 S**	715	80.6	**81.9**	82.2	79.7	0.79	**0.73**	0.66	0.52	5.1	5.3	20	29.4	2.1	2.8	0.0314	61
3	**132 M**	715	81.5	**83.0**	83.4	81.5	0.79	**0.75**	0.67	0.54	6.7	5.6	20	40.1	2.3	2.9	0.0395	74
4	**160 MA**	720	85.1	**86.0**	85.8	84.1	0.76	**0.74**	0.64	0.52	8.8	6.2	30	53.1	2.4	3.2	0.0753	118
5.5	**160 MB**	715	85.1	**86.6**	87.3	86.3	0.80	**0.77**	0.71	0.59	11.5	5.8	25	73.5	2.2	2.8	0.0931	119
7.5	**160 L**	715	85.2	**87.2**	88.1	87.8	0.83	**0.79**	0.74	0.63	15.1	5.9	30	100	2.3	2.9	0.126	145
11	**180 L**	730	86.8	**87.8**	87.9	86.4	0.81	**0.77**	0.70	0.57	22.7	6.0	14	144	1.8	2.3	0.203	184
15	**200 L**	725	86.8	**88.2**	88.7	87.9	0.80	**0.77**	0.70	0.57	31	5.5	15	198	1.9	2.3	0.339	255
18.5	**225 S**	735	90.1	**91.3**	91.5	90.6	0.78	**0.76**	0.72	0.61	37	5.2	40	241	1.8	2.2	0.491	271
22	**225 M**	730	88.2	**90.0**	90.7	90.1	0.77	**0.78**	0.75	0.66	44	4.4	35	288	1.5	1.8	0.547	297
30	**250 M**	740	92.4	**92.4**	92.3	91.3	0.86	**0.81**	0.76	0.66	56	6.2	20	387	2.0	2.4	0.834	410
37	**280 S**	740	92.4	**92.5**	92.4	91.1	0.79	**0.78**	0.73	0.63	71	5.3	• [3]	478	1.9	2.5	1.39	525
45	**280 M**	740	92.3	**92.6**	92.6	91.5	0.80	**0.78**	0.73	0.63	87	6.2	• [3]	581	2.2	3.2	1.65	595
55	**315 S**	740	93.0	**93.0**	93.0	91.5	0.83	**0.82**	0.76	0.66	101	6.5	• [3]	710	1.7	2.4	4.79	1000
75	**315 MA**	740	93.5	**93.5**	93.5	92.0	0.85	**0.82**	0.78	0.67	136	6.8	• [3]	968	1.8	2.4	5.58	1100
90	**315 LA**	740	93.5	**93.7**	93.5	92.0	0.85	**0.82**	0.78	0.67	163	7.0	• [3]	1161	1.9	2.5	6.37	1160
110	**315 LB**	740	94.0	**94.1**	93.5	92.0	0.85	**0.83**	0.80	0.76	196	6.8	• [3]	1420	1.7	2.3	7.23	1230
132	**355 MA**	742	94.6	**94.7**	94.4	93.1	0.83	**0.82**	0.79	0.71	236	6.2	-	1699	1.4	2.5	7.9	1660
160	**355 MB**	742	94.4	**94.7**	94.7	94.4	0.85	**0.85**	0.84	0.82	277	5.9	-	2059	1.4	2.5	10.3	1740
200	**355 LB**	742	94.5	**94.8**	94.2	92.2	0.85	**0.84**	0.83	0.80	351	6.2	-	2574	1.4	2.5	12.3	1980

This data is provided for guidance only. Results are guaranteed only when confirmed by test results.

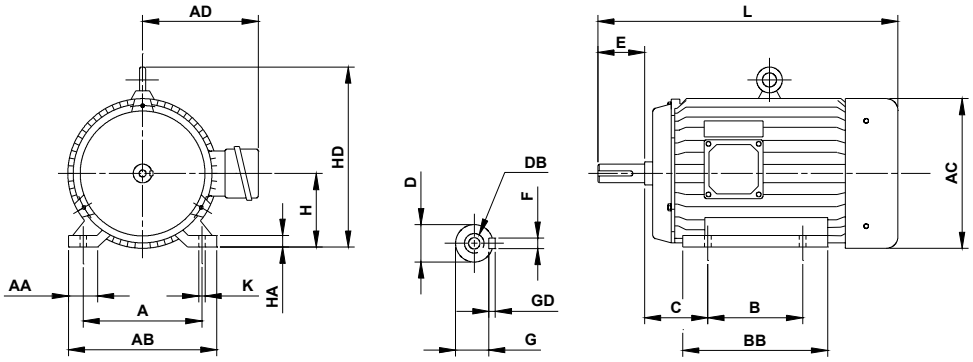
[1] Class F temperature rise

[2] t_E time applies to Ex e motors only and is explained in the hazardous areas section.

[3] SGAE motors from 37 to 110 kW 8 pole are under development.

Dimensional drawings

Foot mount B3 (IM1001)

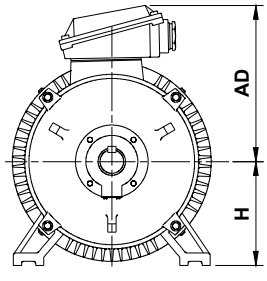


Motor frame	A	AA	AB	AC	AD	B	BB	C	D	DB	E	F	GD	G	H	HA	HD	K	L
71[2)]	112	32	144	138	126[2)]	90	120	45	14	M5	30	5	5	11	71	8	197[1) 2)]	7	249
80	125	40	165	165	145	100	130	50	19	M6	40	6	6	15.5	80	10	170[1)]	10	285
90S	140	40	180	175	150	100	130	56	24	M8	50	8	7	20	90	12	190[1)]	10	310
90L	140	40	180	175	150	125	155	56	24	M8	50	8	7	20	90	12	190[1)]	10	335
100L	160	40	205	205	170	140	176	63	28	M10	60	8	7	24	100	14	245	12	380
112M	190	50	245	230	175	140	180	70	28	M10	60	8	7	24	112	15	265	12	400
132S	216	60	280	275	195	140	200	89	38	M12	80	10	8	33	132	18	315	12	475
132M	216	60	280	275	195	178	238	89	38	M12	80	10	8	33	132	18	315	12	515
160M	254	70	320	325	255	210	270	108	42	M16	110	12	8	37	160	20	375	15	600
160L	254	70	320	325	255	254	314	108	42	M16	110	12	8	37	160	20	375	15	645
180M	279	70	356	360	270	241	311	121	48	M16	110	14	9	42.5	180	22	410	15	670
180L	279	70	356	360	270	279	349	121	48	M16	110	14	9	42.5	180	22	410	15	710
200L	318	75	395	400	310	305	375	133	55	M20	110	16	10	49	200	25	460	19	775
225S	356	75	435	450	335	286	368	149	60*	M20	140*	18*	11*	53*	225	28	520	19	820*
225M	356	75	435	450	335	311	393	149	60*	M20	140*	18*	11*	53*	225	28	520	19	845*
250M	406	80	490	495	385	349	455	168	65*	M20	140*	18*	11*	58*	250	30	575	24	930*
280S	457	85	550	555	410	368	530	190	75*	M20	140*	20*	12*	67.5*	280	35	640	24	1000*
280M	457	85	550	555	410	419	581	190	75*	M20	140*	20*	12*	67.5*	280	35	640	24	1050*
315S	508	125	635	640	530	406	620	216	80*	M20	170*	22*	14*	71*	315	50	770	28	1200*
315M	508	125	635	640	530	457	670	216	80*	M20	170*	22*	14*	71*	315	50	770	28	1250*
315L	508	125	635	640	530	508	720	216	80*	M20	170*	22*	14*	71*	315	50	770	28	1350*
355M	610	135	730	715	608	560	810	254	95*	M20	170*	25*	14*	86*	355	52	847	28	1555*
355L	610	135	730	715	608	630	810	254	95*	M20	170*	25*	14*	86*	355	52	847	28	1555*

[1)] No eye bolt frames 71 to 90.
[2)] Frame 71 only available as SGAT series.

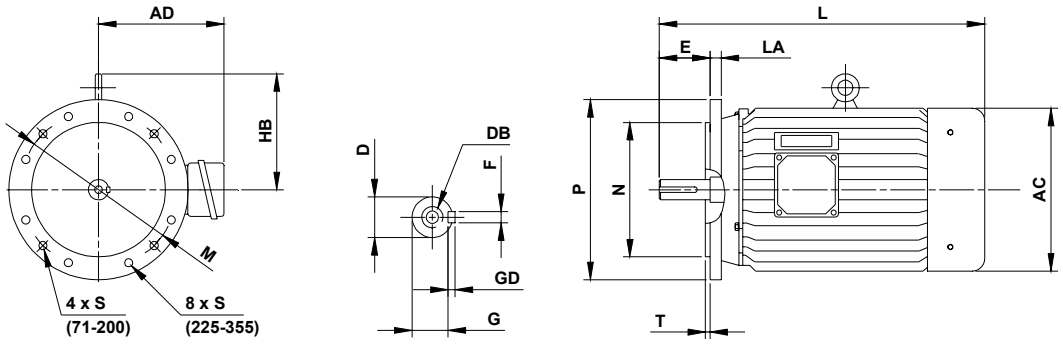
*2 pole variances

Motor frame	D	E	F	GD	G	L
225S	55	110	16	10	49	790
225M	55	110	16	10	49	815
250M	60	140	18	11	53	930
280S	65	140	18	11	58	1000
280M	65	140	18	11	58	1050
315S	65	140	18	11	58	1170
315M	65	140	18	11	58	1220
315L	65	140	18	11	58	1320
355M	75	140	20	12	67.5	1525
355L	75	140	20	12	67.5	1525



Optional SGAT Series

Large flange mount B5 (IM3001)



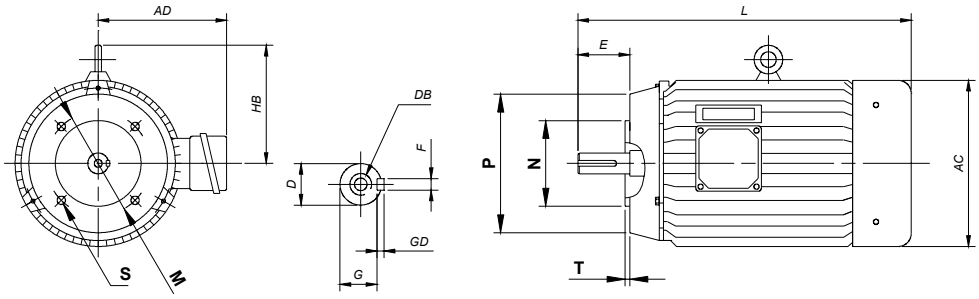
Motor frame	AC	AD	D	DB	E	F	GD	G	HB	L	LA	M	N	P	S	T
71[2)]	138	126[2)]	14	M5	30	5	5	11	126[1)2)]	249	12	130	110	160	10	3.5
80	165	145	19	M6	40	6	6	15.5	90[1)]	285	12	165	130	200	12	3.5
90S	175	150	24	M8	50	8	7	20	100[1)]	310	12	165	130	200	12	3.5
90L	175	150	24	M8	50	8	7	20	100[1)]	335	12	165	130	200	12	3.5
100L	205	170	28	M10	60	8	7	24	145	380	14	215	180	250	15	4.0
112M	230	175	28	M10	60	8	7	24	153	400	14	215	180	250	15	4.0
132S	275	195	38	M12	80	10	8	33	183	475	14	265	230	300	15	4.0
132M	275	195	38	M12	80	10	8	33	183	515	14	265	230	300	15	4.0
160M	325	255	42	M16	110	12	8	37	215	600	16	300	250	350	19	5.0
160L	325	255	42	M16	110	12	8	37	215	645	16	300	250	350	19	5.0
180M	360	270	48	M16	110	14	9	42.5	230	670	18	300	250	350	19	5.0
180L	360	270	48	M16	110	14	9	42.5	230	710	18	300	250	350	19	5.0
200L	400	310	55	M20	110	16	10	49	260	775	18	350	300	400	19	5.0
225S	450	335	60*	M20	140*	18*	11*	53*	295	820*	20	400	350	450	19	5.0
225M	450	335	60*	M20	140*	18*	11*	53*	295	845*	20	400	350	450	19	5.0
250M	495	385	65*	M20	140*	18*	11*	58*	325	930*	22	500	450	550	19	5.0
280S	555	410	75*	M20	140*	20*	12*	67.5*	360	1000*	22	500	450	550	19	5.0
280M	555	410	75*	M20	140*	20*	12*	67.5*	360	1050*	22	500	450	550	19	5.0
315S	640	530	80*	M20	170*	22*	14*	71*	455	1200*	25	600	550	660	24	6.0
315M	640	530	80*	M20	170*	22*	14*	71*	455	1250*	25	600	550	660	24	6.0
315L	640	530	80*	M20	170*	22*	14*	71*	455	1350*	25	600	550	660	24	6.0
355M	715	608	95*	M20	170*	25*	14*	86*	492	1555*	32	740	680	800	24	6.0
355L	715	608	95*	M20	170*	25*	14*	86*	492	1555*	32	740	680	800	24	6.0

[1)] No eye bolt frames 71 to 90.
[2)] Frame 71 only available as SGAT series.

*2 pole variances

Motor frame	D	E	F	GD	G	L
225S	55	110	16	10	49	790
225M	55	110	16	10	49	815
250M	60	140	18	11	53	930
280S	65	140	18	11	58	1000
280M	65	140	18	11	58	1050
315S	65	140	18	11	58	1170
315M	65	140	18	11	58	1220
315L	65	140	18	11	58	1320
355M	75	140	20	12	67.5	1525
355L	75	140	20	12	67.5	1525

Small flange (face) mount B14 (IM3601)



B14A

Motor frame	M	N	P	S	T
71	85	70	105	M6	2.5
80	100	80	120	M6	3.0
90	115	95	140	M8	3.0
100	130	110	160	M8	3.5
112	130	110	160	M8	3.5
132	165	130	200	M10	3.5
160	215	180	250	M12	4.0

B14B

Motor frame	M	N	P	S	T
80	130	110	160	M8	3.5
90	130	110	160	M8	3.5
100	165	130	200	M10	3.5
112	165	130	200	M10	3.5
132	215	180	250	M12	4.0

For motor frame and shaft dimensions refer large flange mount B5 dimensional drawings (previous page).

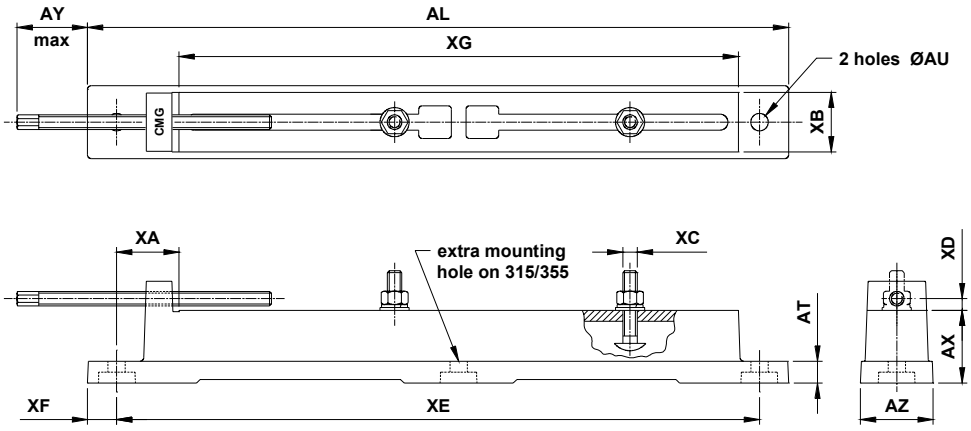
Slide rails

Slide rails are designed for motor position adjustment. Applications include tension adjustment for belt driven equipment.

CMG stock slide rails to suit frame sizes 80 to 355.

Rail sets are manufactured from cast iron and provided with mounting bolts and nuts between motor and rail.

Dimensional specifications for the range are set out in the accompanying table. Slide rails provided by CMG comply with **AS1359.10-1989**.



Slide rail Product Code	To suit motor frame	Dimensions [mm] AL	AT	AU	AX	AY	AZ	XA	XB	XC	XD	XE	XF	XG	Weight per set [kg]
MR 080 090 S	**80 / 90**	355	12	10	30	90	35	40	32	8	7	323	16	268	3.0
MR 100 132 S	**100 / 112 / 132**	469	16	12	44	130	51	60	49	10	7	430	18	349	6.5
MR 160 180 S	**160 / 180**	616	20	15	65	155	77.5	67	51.5	12	13	564	24	471	15
MR 200 225 S	**200 / 225**	784	25	19	82	210	100	75	80.5	16	14	725	28.5	635	35
MR 250 280 S	**250 / 280**	965	30	24	100	230	100	86	82	20	16	885	40	770	60
MR 315 355 S	**315 / 355**	1215	40	28	125	310	120	110	95	24	20	1115	50	965	85

Modifications and variations

CMG offer an extensive range of variations to the SGA motor series. Other SGA ranges outlined in later sections include:

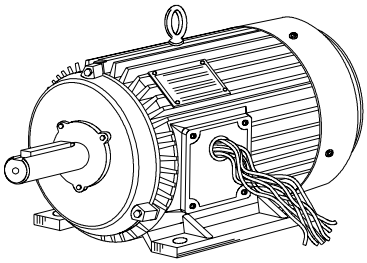
Multi-speed
Brake motors – **SGAB** and **SGABN**
Smokespill applications – **SGASS** and **SGAHS**
Airstream motors for axial fans – **SGAR**
Cooling tower motors – **SGACT**
Hazardous area motors – **SGAE**, **SGAN** and **SGAD**
Mining specification motors – **SGAM**

Additional to these motor ranges CMG offer a large array of modifications available on order. These modifications are outlined below.

Terminal box

SGA motors come standard with a terminal box on the right hand side viewed from drive end.
The following alternatives are available:

- Left hand terminal box – **SGAL**
- Top mounted terminal box – **SGAT**
- Removed terminal box (fitted with a blanking plate and threaded conduit entry. Extended leads, including earth connector)



7 leads x 1 metre or as specified.

Blanking Plate	
Motor frame	Conduit Size
71-132	M25 x 1.5
160-180	M32 x 1.5
200-315	M50 x 1.5

Bearings

CMG can address applications where bearings need special consideration. Attention may need to be given to the following:

- Bearing monitors
- Alternative bearing types
- Low/high temperature bearing grease
- Oil seals
- Non contact labyrinth seals
- Insulated bearings

Shafts

SGA motors come standard with a single output shaft to Australian standard dimensions. The following alternatives are available:

- Double shaft extension
- Special shaft extension
- Stainless steel shaft material type
- Reduced shafts for geared motors – **SGAG**
  [Also available with smaller flange – **SGAGA**]

Environmental considerations

Where environmental factors need special consideration CMG can provide the following modifications:

- Winding temperature monitors and thermistors
- Anti-condensation heaters
- Separately powered cooling blowers
- Tropic proofing
- Special paint finish
- Stainless steel name plates
- Higher International Protection ratings, IP56, IP65 and IP66
- High ambient temperature motors – **SGAH** with H class insulation

Special performance

CMG has the ability to provide SGA motors with special windings. These may include:

- 10,12, 16 and 24 pole single speed windings
- Three and four speed windings
- Windings for alternative operating voltages and frequencies
- Windings designed for increased outputs and short time ratings

Accessories

Accessories available for CMG SGA motors include:

- Slide rails (refer opposite page)
- VVVF drives
- Alternative paint colors
- Rain cowls
- Uni-directional and bi-directional low-noise fans

Testing services

CMG can provide both type test certificates and individual motor test reports on any CMG SGA motor. Testing is carried out by CMG Technology Pty Ltd in our own NATA accredited test laboratory

CMG technology

NATA
Accreditation
No. 14396

Two speed motors

The CMG range of SGA two speed motors, includes both constant torque and fan duty designs. Wound with either a single winding (requiring appropriate switchgear) or separate windings designed for D.O.L. connection on each speed.

Whilst we offer all 2 speed combinations (refer product code specifications) we list below the main 2 speed fan duty requirements.

High Speed KW	Low speed kW	Frame	High speed r/min	Low speed r/min
3000/1500 r/min = 2/4 Poles				
Fan duty – single winding ⅄⅄/⅄ (MAE)				
0.8	0.16	80B-4	2840	1440
1.2	0.24	90S-4	2850	1445
1.7	0.34	90L-4	2850	1445
2.4	0.48	100L-2	2855	1450
3.3	0.66	112M-2	2880	1460
4.4	0.88	132SA-2	2890	1445
6.1	1.2	132SB-2	2890	1445
8.3	1.7	160MA-2	2925	1470
12	2.4	160MB-2	2920	1465
17	3.4	160L-2	2925	1470
20	4.0	180M-2	2930	1470
24	4.8	200LA-2	2935	1475
33	6.6	200LB-2	2940	1475
41	8.2	225M-2	2940	1475
50	10	250M-2	2950	1480
61	12	280S-2	2950	1480
83	17	280M-2	2955	1480
99	20	315S-2	2955	1480
121	24	315MA-2	2955	1480
145	29	315LA-2	2960	1485
176	35	315LB-2	2960	1485
1500/1000 r/min = 4/6 Poles				
Fan duty – separate windings ⅄/⅄ (MBJ)				
0.55	0.18	80B-4	1410	940
0.75	0.25	90S-4	1405	935
1.1	0.36	90L-4	1410	940
1.5	0.50	100LA-4	1435	955
2.2	0.75	100LB-4	1440	960
3.0	1.0	112M-4	1440	965
4.0	1.3	132S-4	1440	960
5.5	1.8	132M-4	1450	975
7.5	2.5	160M-4	1465	975
11	3.5	160L-4	1470	980
15	5.0	180L-6	1470	985
18.5	6.1	200LA-6	1480	985
22	7.3	200LB-6	1480	985
33	11	225M-6	1475	990
45	15	250M-6	1485	990
55	18	280M-6	1480	990
75	25	315S-6	1480	990
90	30	315MA-6	1480	990
110	36	315LA-6	1480	990
132	44	315LB-6	1480	990

Outlined sizes nominally available ex-stock (policy subject to change)

High speed kW	Low speed kW	Frame	High speed r/min	Low speed r/min
1500/750 r/min = 4/8 Poles				
Fan duty – single winding ⅄⅄/⅄ (MAK)				
0.6	0.12	80B-4	1410	670
0.8	0.16	90S-4	1435	680
1.2	0.24	90L-4	1420	690
1.7	0.34	100LA-4	1435	715
2.4	0.5	100LB-4	1430	715
3.3	0.7	112M-4	1425	710
4.4	0.9	132S-4	1440	720
6.1	1.2	132M-4	1440	720
8.3	1.7	160M-8	1445	725
12	2.4	160L-8	1455	735
17	3.4	180M-4	1470	730
20	4.0	180L-4	1480	730
24	5.0	200L-4	1480	740
33	6.6	225S-4	1480	740
41	8.2	225M-4	1480	740
50	10	250M-4	1480	740
61	12	280S-4	1480	740
83	17	280M-4	1485	740
99	20	315S-4	1485	740
121	24	315MA-4	1485	740
145	29	315LA-4	1485	740
176	35	315LB-4	1485	740
1000/750 r/min = 6/8 Poles				
Fan duty – separate windings ⅄/⅄ (MBN)				
0.55	0.24	90S-6	940	680
0.75	0.32	90L-6	940	710
1.1	0.47	100L-6	950	715
1.5	0.65	112M-6	955	715
2.2	0.95	132S-6	965	720
3.0	1.3	132MA-6	965	725
4.0	1.7	132MB-6	965	725
5.5	2.4	160M-6	970	730
7.5	3.2	160L-6	970	730
11	4.7	180L-8	985	735
13	5.5	200L-8	985	735
15	6.5	225S-8	985	735
21	9.0	225M-8	985	735
26	11	250M-6	985	735
30	13	280S-6	985	735
37	16	280M-6	985	735
53	23	315S-6	990	740
65	28	315MA-6	990	740
80	34	315LA-6	990	740
92	40	315LB-6	990	740

Brake motors – SGAB

CMG offer a wide range of Brake motors, **SGAB**, from frame size 71 through to 180. 4 pole models are stocked as standard. 2,6 and 8 pole and other non-standard sizes and speeds are available on special order.

Both brake and motor have a protection degree of IP55.

Also available is the **SGABN** series, a brake motor which has no fan or cowl, used for intermittent duty application, having a protection degree of IP65.

SGAB brake motors are fail to safe design, as the brake will engage when power is interrupted.

Brake motors are designed for use in applications requiring rapid stopping, holding and position control.

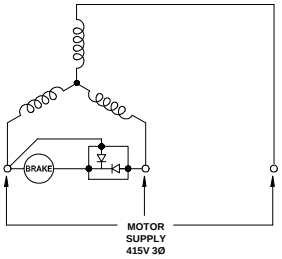
SGAB motors are available in all mounting arrangements.

Brakes are made to the 'Euro' standard mounting dimension, providing interchangeability with other brands.

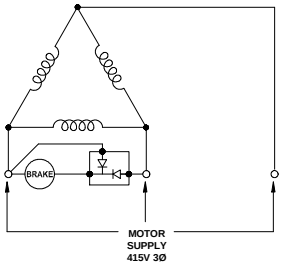
Cast iron brake enclosures for hazardous locations are also available.

Connection

SGAB Motors 3 kW and below are connected in 415 volt star connection with brake connected as shown.



SGAB Motors 4 kW and above[1] are connected in 415 volt delta connection with brake connected as shown.

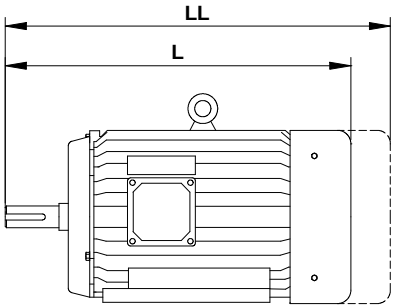


The **SGAB** 3 phase motor is fitted with a CE certified DC brake and half wave rectifier mounted in the terminal box enabling direct connection of the brake to the AC supply.

Where response time is important, this time can be improved by switching the brake on the DC current side of the rectifier. (These additional terminals are standard on the rectifier fitted to the 160 to 180 frame motors.)

Dimensions

The only dimensional variations of **SGAB** from SGA is the overall motor length, due to the extended length of the cowl. These dimensional variations are listed in the accompanying table. Overall length L is replaced by LL.



Motor frame	Brake motor overall length, LL
71	296
80	341
90S	372
90L	397
100L	448
112M	473
132S	573
132M	613
160M	700
160L	745
180M	790
180L	827

Brake details

Output kW	Motor frame	Brake Model	Brake weight [kg]	Motor full load torque T_N [Nm]	Brake torque normal [Nm]			Brake torque [% of full load]		
					Normal	Min	Max	**Normal**	Min	Max
0.37	71B-4	M4	1.1	2.6	4	1.4	5	**150%**	50%	190%
0.55	80A-4	M8	1.8	3.7	8	2.8	10	**220%**	80%	270%
0.75	80B-4	M8	1.8	5.1	8	2.8	10	**160%**	50%	200%
1.1	90S-4	M16	3.4	7.4	16	5.5	20	**220%**	70%	270%
1.5	90L-4	M16	3.4	10.3	16	5.5	20	**160%**	50%	190%
2.2	100LA-4	M32	4.5	14.6	32	11	40	**220%**	80%	270%
3	100LB-4	M32	4.5	20.0	32	11	40	**160%**	60%	200%
4	112M-4	M60[2]	7.4	26.7	60	20	75	**220%**	70%	280%
5.5	132S-4	M60[2]	7.4	36.6	60	20	75	**160%**	50%	200%
7.5	132M-4	M100	13.6	50	100	35	125	**200%**	70%	250%
11	160M-4	M150	19	72	150	50	185	**210%**	70%	260%
15	160L-4	M150	19	98	150	50	185	**150%**	50%	190%
18.5	180M-4	M250	33	120	250	90	310	**210%**	80%	260%
22	180L-4	M250	33	142	250	90	310	**180%**	60%	220%

[1] Motor frames 160 & 180 have an alternative connection diagram due to alternative rectifier. Please contact CMG for details.

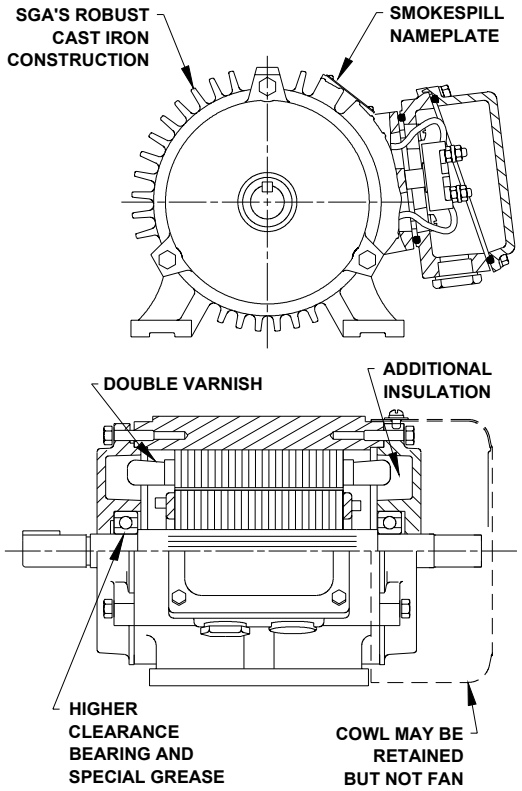
[2] 4kW was previously supplied with a M32 brake, 5.5kW was previously supplied with a M100 brake.

For further technical details regarding the brake, please contact your nearest CMG office.

Smokespill application – SGASS/SGAHS

Smokespill application motors are designed to withstand the extreme environmental conditions associated with a building fire. Ventilation systems within public buildings are required to continue providing smoke extraction for 2 hours at smokespill air temperature of 200°C or for 30 minutes at 300°C, designated respectively as rating-1 or rating-2 in accordance with **AS/NZS1668.1-1998.**

The standard **SGASS** range, wound with F class insulation in frame sizes 80A to 180L- 0.55 to 22kW- 2 to 8Pole meet the rating-1 requirements. **SGAHS** range, wound with H class insulation in frame sizes 80A to 200L- 0.55 to 30kW- 2 to 8Pole meet either rating-1 or rating-2 requirements.



Smokespill features

The standard SGA motor is inherently suitable for upgrading to the smokespill application due to its low temperature rise. When **SGASS** motors are ordered SGA F class motors are modified and when **SGAHS** motors are ordered SGA H class motors are modified in accordance with our standard operating procedures which include the following:

- C3 internal clearance bearings lubricated with extra high temperature specification grease
- Special name plate specifying smokespill suitability
- Double insulated terminal leads
- Double varnish system for winding end turns
- Fan and cowl removed if present on the original motor; cowl may sometimes remain to protect from bare shaft
- Motors tested prior to despatch
- Extra High Temperature Grease (Magnalube G)

Certification and testing

Australian standard AS 4429-1999 specifies the methods of test and rating requirements for smokespill fans. A range of motors was selected in consultation with a competent authority on this subject. Testing of motors was carried out in a specially designed re-circulating duct system. The test rig and the methods of test were also witness approved by a competent authority. A series of tests were conducted to certify our entire range of SGASS and SGAHS motors.

T.E.A.S.R. (Totally Enclosed Air Stream Rated - no fan and cowl)

The **SGASS** range is normally supplied without fan and cowl, relying on the air flow generated by the driven fan to provide the necessary cooling during normal operation thereby ensuring high temperature operation will not cause the plastic fan to melt.

Motors are normally supplied with the non drive end stub shaft exposed, as it is expected to be shrouded by the fan housing and duct work when installed. If this presents a problem in a specific application, either removal of this shaft can be requested, or the standard fan cowl can be fitted, but without the motor fan. Alternatively the SGAR series can be used as the base motor.

Terminations

SGASS motors can be supplied either with terminal boxes or with extended leads through a gland plate (see page 21 for details). In either case, it is the installers responsibility to ensure that suitable high temperature leads, conduit and fittings are installed to take the motor leads outside the fan case. CMG can supply terminal boxes and terminal blocks for installation outside the fan drum if required.

Paint

Standard color finish for the **SGASS** range is grey (fire engine red primary option) and **SGAHS** fire-engine red (see photograph inside front cover). Other colors are available on request.

Nameplates

CMG Smokespill motors are marked with special nameplates labeling its suitability for smokespill duty and stating specific temperature condition ratings and lubrication details. Additional plates for external mounting to fan assemblies are available on request.

Maintenance

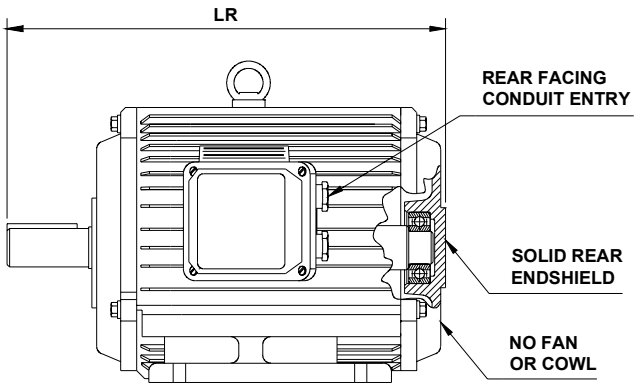
Because of the safety related nature of smokespill motors proper maintenance schedules are imperative, especially where the motor is used for dual purposes ie. continuous running for normal ventilation as well as for smokespill application. Serious consideration needs to be given to bearing and insulation deterioration caused by use for extended periods for normal ventilation duty.
It is important that the motor remains within its stated rating both on initial commissioning and after any adjustments to the ventilation system.

Airstream motors for axial fans – SGAR

CMG offer a comprehensive range of motors specifically built for use with axial flow fans, where the motor is mounted in the airstream.

Provided the airstream ensures ample cooling, the fan and cowl normally fitted to a standard TEFC motor is redundant. Enclosure rating of the motor is also improved with the use of a solid rear endshield.

Due to the elimination of losses associated with the motor fan SGAR motors have a higher efficiency than standard SGA motors.



For ease of installation in the fan duct the motor terminal box is usually fitted with the conduit entries facing the rear of the motor.

SGAR series motors are normally available ex stock in frame sizes 80 to 180, 4 pole 0.55 to 22 kW and 6 pole 0.37 to 15 kW. (Other sizes available on request).

Motor Frame	Dimension LR
80	240
90S	260
90L	285
100L	320
112M	355
132S	390
132M	430
160M	532
160L	577
180M	590
180L	630

Cooling tower – SGACT

CMG **SGACT** cooling tower motors are specially developed for operation in air stream rated cooling towers. **SGACT** motors are available in frame sizes 80 to 355, and rated power outputs of 0.37 to 315 kW.

Applications

SGACT motors are ideally suited to the cooling tower application, in industries such as food and beverage, airconditioning, chemical processing, and petrochemical.

Protection

CMG **SGACT** motors have a protection rating of IP66 for maximum protection against water and dust.

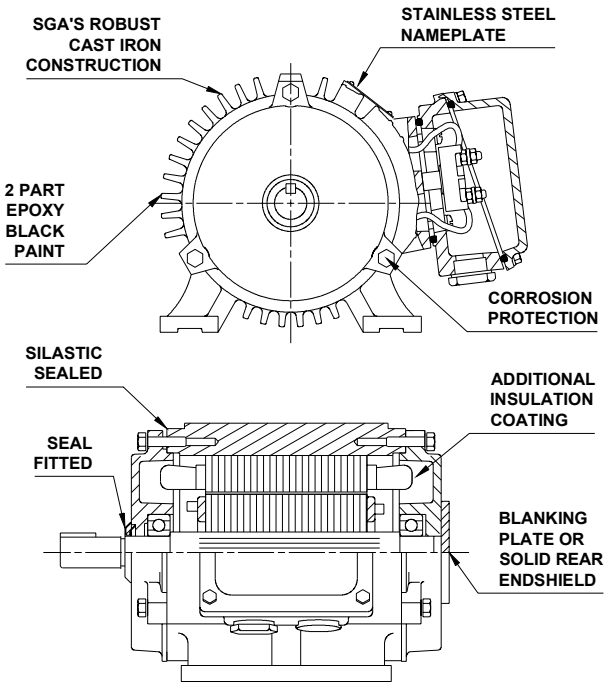
Additional enhancements

- 2 part Epoxy coated for excellent protection against corrosive solids and liquids
- Stainless steel name plate
- Corrosion protection on threads
- Extra insulation coating (Red Isonel 300)
- Shaft seal fitted
- Silastic sealed
- Cut off non-drive end shaft extension and fit blanking plate (or use SGAR as base motor).

Paint

Standard paint finish for **SGACT** motors is a 2 part epoxy black paint. (See photograph inside front cover.)

CMG's **SGACT** range of cooling tower motors combine the SGA's standard high strength and high efficiency with significant enhancements to give the perfect motor for cooling tower applications.



Motors for hazardous areas – SGAE/SGAN/SGAD

Motors used within a hazardous location require a higher level of protection against the risk of harmful occurrences. CMG SGA motors are available in the three most common high protection configurations, Ex e, Ex n and DIP, supplied with protection ratings IP65 or IP66. SGA Hazardous area motors are available in motor frame sizes 71 to 250. Larger sizes are under development.

Combinations of protection such as Ex e and DIP or Ex n and DIP are also available.

Australian Standards

AS 2381.1-1991 and AS 2381.10-1995 specify general requirements for the selection of electrical equipment, and its installation and maintenance to ensure safe use in areas where flammable materials are generated, prepared, processed, handled, stored or otherwise used, and which are therefore potentially hazardous.

The term 'flammable material' includes gas, vapors, liquids, mists, solids and dusts, but does not include those materials which are specifically manufactured as explosives or materials which are inherently explosive.

The requirements of the listed standards apply only to the use of electrical equipment under normal or near normal atmospheric conditions. The requirements specified for hazardous location electrical equipment are supplementary to and not alternative to any requirements which would apply to equipment and installations in non-hazardous areas.
(see AS3000-1991).

Paint

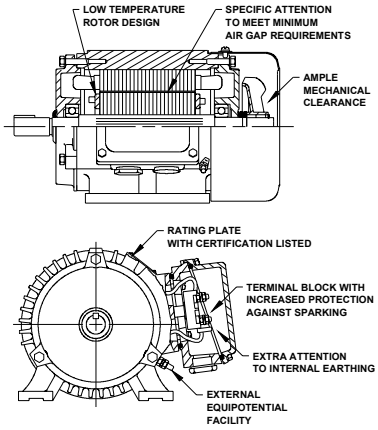
Standard color finish for the hazardous area range is grey, with primary options of yellow for **SGAE** and **SGAN**, and green for **SGAD** (see photographs inside front cover). Other colors are available on request.

Motor protection types

SGAE – Ex e

Ex e motor protection designates **Increased safety** as outlined in AS2380.6-1988.

Briefly, the increased safety (Ex e) type of protection describes electrical equipment that does not produce arcs or sparks in normal service in which additional measures are applied so as to give increased security against the possibility of excessive temperatures and of the occurrence of arcs and sparks.



Increased safety (Ex e) motors are suitable for Class I, Zone 1, Group IIA,B&C hazardous areas, and CMG provides for a temperature class of T3 (200°C)
(see next page for explanations of classes, zones and groups.)

Ex e Protection - (t_E time)

t_E time is the time it takes for the stator winding or rotor cage to heat up from normal operating temperature, at the highest permitted ambient temperature, to the highest permitted limit temperature (temperature class), with the rotor locked and the stator winding loaded with the starting current.

For selection and setting of suitable current dependent protection the t_E time and the ratio of locked rotor current to nominal current are used. In the case of a rotor locking, this device must cut off the supply within the specified t_E time, which is listed in the performance data.

SGAN – Ex n

Ex n motor protection designates **Non-sparking** as outlined in AS2380.9-1991.

Briefly, the non-sparking (Ex n) type of protection describes electrical equipment that, in normal operation, is not capable of igniting a surrounding explosive atmosphere, and a fault capable of causing ignition is not likely to occur.

Non-sparking (Ex n) motors are suitable for Class I, Zone 2, Group IIA,B&C hazardous areas, and CMG provides for a temperature class of T3 (200°C)
(see next page for explanations of classes, zones and groups.)

SGAD – DIP

DIP motor protection designates **Dust-excluding Ignition Proofing** as outlined in AS2236-1994.

Briefly, the Dust-excluding ignition proofing (DIP) type of protection describes electrical equipment which is enclosed so that it excludes dust, and which will not permit arcs, sparks or heat otherwise generated or liberated inside the enclosure to cause ignition of exterior accumulations or atmospheric suspensions of a specific dust on or in the vicinity of the enclosure.

Dust-excluding ignition proofed (DIP) motors are suitable for Class II hazardous areas, and CMG provides for a temperature class of T4 (135°C)
(see next page for explanations of classes.)

Hazardous area classifications

Hazardous areas fall into two classes: hazards due to flammable gases (vapors or mists) and hazards due to combustible dusts (fibers or flyings), Class I and Class II respectively, and are briefly explained below.

Gaseous Hazards – Class I

Class I hazards are specified by Zone and Group.

The word 'Zone' is internationally accepted as indicating the probability of the presence of a flammable, combustible or explosive material, and the extent, dimension and shape of the hazardous area and the volume in which the hazardous material can be expected.

AS2430.1-1987 defines three zones:

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

Groups are defined as follows:

Group I – coal mining (methane)
Group II – other industries

High surface temperatures can cause ignition of flammable gases or vapors therefore the surface temperature of equipment in hazardous areas must not exceed the ignition temperature of these gases or vapors.

Group I electrical equipment may not have a surface temperature that exceeds 150°C where coal dust can form a layer, and 450°C for internal surfaces where the above risk is avoided by sealing against ingress or dust.

Group II electrical equipment may not have a surface temperature that exceeds its specified temperature class, as listed in the table below.

Temperature class of electrical equipment	Maximum surface temperature of electrical equipment	Ignition temperature of gas or vapor
T1	≤ 450°C	> 450°C
T2	≤ 300°C	> 300°C
T3	≤ 200°C	> 200°C
T4	≤ 135°C	> 135°C
T5	≤ 100°C	> 100°C
T6	≤ 85°C	> 85°C

Group specification and characteristics of some common flammable liquids, gases and vapors are listed in the table below.

Material	Boiling point [°C]	Flash point [°C]	Ignition temp. [°C]	Gas group
Acetone	56	-20	465	IIA
Acetylene	-83	Gas	305	IIC
Ammonia	-33	Gas	651	IIA
Benzene	80	12	498	IIA
Butane	-1	Gas	287	IIA
Carbon monoxide	-192	Gas	609	IIA
Ethane	-89	Gas	472	IIA
Ethyl alcohol	78	55	363	IIA
Ethylene	-104	Gas	450	IIB
Heptane	98	-4	204	IIA
Hydrogen	-252	Gas	500	IIC
Hydrogen cyanide	26	-18	538	IIB
Methane	-162	Gas	537	IIA
Propane	-42	Gas	432	IIA
Toluene	111	4	480	IIA

Note the data given in this table is derived from NFPA 325M. Flashpoint is the lowest temperature at which a material gives off sufficient vapor to form an explosive gas/air mixture in the air immediately above the surface.

Equipment within a specific group may only be used within a location with an equal or less level of hazard. Allowable groups are summarized in the table below.

Gas group	Allowable Equipment group
IIA	IIA, IIB, IIC
IIB	IIB, IIC
IIC	IIC

Particle Hazards – Class II

Dust areas cannot be divided into normal and abnormal conditions dependent upon time like gases and vapours since the accumulation of dust, unlike gas, is not self-correcting by ventilation over a period of time.

Combustible dusts, fibres or flyings are delineated in AS 2430.2-1986 as follows:

(a) Electrically conductive dusts – Areas in which combustible dusts, fibres or flyings of an electrically conductive nature are present, regardless of particle size.

(b) Electrically non-conductive dusts – Areas in which electrically non-conductive combustible dusts, fibres or flyings of such fineness as to be capable of producing explosive mixtures when suspended in the air.

It should be noted that the distinction between these two types does not affect the selection of equipment for dust areas.

The following table summarizes the relationship between temperature class, surface temperature and cloud or layer ignition temperature (whichever is the lower).

Temperature class of electrical equipment	Maximum surface temperature of electrical equipment	Cloud or layer ignition temperature of dust
T1	≤ 450°C	≥ 500°C
T2	≤ 300°C	≥ 350°C
T3	≤ 200°C	≥ 250°C
T4	≤ 135°C	≥ 185°C
T5	≤ 100°C	≥ 150°C
T6	≤ 85°C	≥ 135°C

Below are some typical characteristics of combustible dusts.

Material	Minimum ignition energy [mJ]	Ignition temperature	
		Cloud [°C]	Layer [°C]
Aluminium	15	550	740
Cellulose	80	480	270
Corn	40	400	250
Flax	80	230	430
Polypropylene	30	420	-
Rayon	2400	520	250
Rice	50	440	220
Rubber (synthetic)	30	320	-
Sugar	30	370	400
Wheat flour	50	380	360

Note the data given in this table is derived from AS2430.2-1986.

Mining specification – SGAM/PPA

SGAM

CMG mining specification motors are specially developed for operation in arduous applications and harsh environments.

SGAM motors are available in frame sizes 71 to 355, and rated power outputs of 0.37 to 315 kW.

Applications

SGAM motors are ideally suited to mining applications, quarries, food and beverage industry chemical processing, petrochemical industry and very wet areas.

Protection

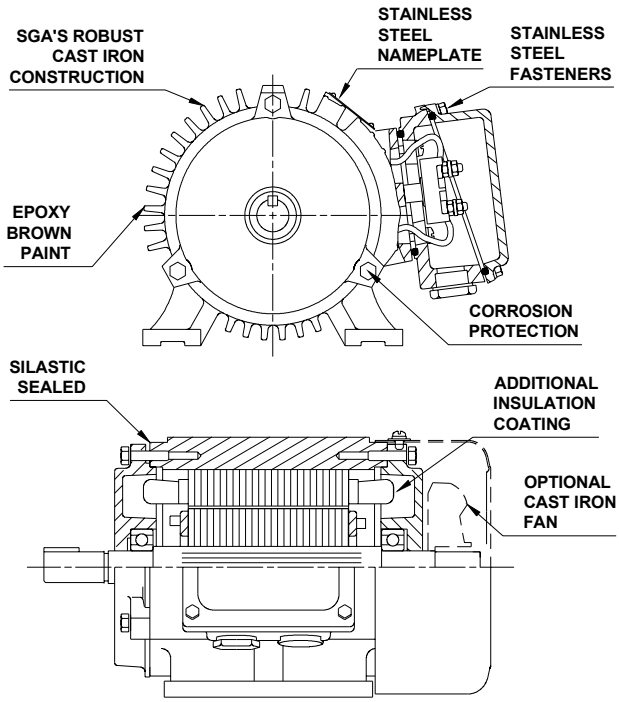
CMG **SGAM** motors have a protection rating of IP66 for maximum protection against water and dust.

Additional enhancements

- Epoxy coated for excellent protection against corrosive solids and liquids
- Stainless steel name plate
- Robust cast iron fan, if specified
- Regreasable bearings 160 frame and above
- PTC thermistors 160 frame and above
- Stainless steel fasteners

Paint

Standard paint finish for **SGAM** motors is an epoxy red oxide (R63) paint.
(See photograph inside front cover.)



CMG's **SGAM** range of mining specification motors combine the SGA's standard high strength and high efficiency with significant enhancements to give the perfect motor for arduous applications.

PPA

CMG's SGAM series will be replaced by our new High Efficiency PPA series which incorporates all of your engineer's specifications as standard.

4 kW to 800 kW – High Efficiency

- **Standard power supply 415 volt, 3 phase, 50hz**
  220 to 1100 volts, 40 to 60Hz optional.
- **AS 1359 frame sizes**[1)]
  Full interchangeability with motors in the field.
- **Full cast iron construction**
  For durability and reliability in operation.
- **TEFC – IP66 enclosure**
  Maximum Protection against dust and water.
- **H Class insulation**
  With a temperature rise limited to 80^{o}C (B class).
- **Winding design life of 20 years**
  H class insulation, Low temperature rise and High efficiency = 20 years design life.
- **Meets new high efficiency standards**
  New Australian Standard, AS/NZS1359.5, specifies High Efficiency levels.
- **Low noise fan and conical fan cover**
  PPA complies with most low noise specifications with standard fan.
- **Cast iron fan and steel fan cover**
  Meets requirements for use in arduous environments and mining specifications.
- **Thru-flush pressure grease relief valve**
  Incorporating a V-ring seal enables regreasing during operation.
- **Oversized terminal box with removable gland plate**
  To suit oversized and/or aluminium cables with Bi-metal lugs.
- **Thermistors, with auxiliary terminal box**
  PTC Thermistors are supplied as standard throughout the entire range.
- **Anti-condensation heaters**
  with auxiliary terminal box, are fitted to frames 250 and above.
- **SPM Vibration sensors**
  For use with the SPM Vibration Monitor. Fitted to frame sizes 250 and above.
- **Central Terminal Box**
  Designed for easy reversal of the terminal box handing from right to left-hand side.
- **Additional external earth screw**
  Located on the motor foot. Frames 250 and above.
- **2 Pack Epoxy paint to customers preferred colour**
  In addition to the epoxy Primer. Top coat is red oxide (R63) where no customer specification
- **Stainless Steel Rating Labels**
  To ensure maximum life and readability of nameplate.

[1)] PPA Series is now available in both Australian/British and CENELEC frame allocations.

Please contact your nearest CMG office for a PPA catalogue.

Installation, operation and maintenance

Delivery
Upon receipt the unit should be thoroughly inspected for any damage sustained during transit.
Any equipment damage or shortfall should be immediately advised to your nearest CMG office.

Storage
If the machine is not to be installed immediately, it should be stored in a clean, dry and preferably warm environment. Shafts of stored motors should be rotated occasionally. Specific vibration during storage may lead to "brinelling" of the bearings, therefore motors that are subject to extended storage where vibration exists, should be fitted with bearing locks.

Installation
All motors must be installed in such a manner as to ensure the air intake is not obstructed. Refer to dimension "BL" in the cooling section of this catalogue. Bed plates or slide rails should be firmly fixed to a solid, level foundation to ensure the motor remains rigid and vibration free. Shims or packers (if required) must be of adequate size and placed adjacent to and between base fixings. Protective transport coatings on shafts and/or flanges must be removed prior to connection to the driven load. A light coating of grease to shafts and/or flanges will inhibit corrosion during service and assist removal of pulleys or couplings.

Coupling drive
In fitting couplings or pulleys to the motor shaft, care must be taken to ensure the roller/ball bearings are not damaged. Tapped holes are provided in shaft extensions to assist in the fitment of couplings and/or pulleys. Under no circumstances should couplings and/or pulleys be impact driven onto the shaft. Couplings or pulleys should be independently balanced with a half key.

Alignment
Great care must be taken in aligning the complete machine, since misalignment can cause rapid deterioration of bearings and lead to other mechanical failures due to the stress produced. After final tightening of foundation bolts, machine alignment should be rechecked as bed plates could distort. No end thrust should be applied to the motor without express approval.

Electrical connection
Ensure all electrical connections are solid and continuous. Check motor starter and overloads for correct rating and trip setting. All circuit breakers, HRC fuses or protective devices associated with the motor must be rated to suit motor running current and starting characteristics.

Initial start up
Prior to initial start up, the following steps must be taken:

- Insulation resistance test. On machines up to 600 volt, the minimum value should be 1MΩ.
- Thermistors if fitted, should be checked for continuity with a multimeter and never mega-tested.
- Ensure supply voltage and frequency correspond to the motor nameplate ratings.
- Ensure shaft turns freely before initial start.
- Measure stator resistance and record in Log Book.

Operation
Standard motors are designed for a 415 volt (±5%) 3 phase, 50 Hertz supply. Use of standard motors on other supply systems should be verified with our office prior to installation. All units are S1 rated to AS1359 and associated standards, for operation below 1000 metres at a maximum ambient temperature of 40°C.

For operation in conditions other than that above please refer to your nearest CMG office.

Electric motor starting imposes severe thermal stress on the motor, the frequency of starting should be minimized to ensure optimum machine life.

Number of starts per hour
The number of starts per hour is dependant on the inertia of the driven load and the load torque demand. When high inertia load is applied (flywheel, heavy fan etc) please refer to your nearest CMG office for advice. A guide to generally acceptable starts per hour would be as per table.

For greater number of starts per hour, please contact your nearest CMG office for advice.

	Starts per hour			
Frame	2 pole	4 pole	6 pole	8 pole
71	-	40	-	-
80	20	40	40	-
90	16	30	40	-
100	16	30	40	40
112	16	30	40	40
132	10	20	25	25
160	10	20	25	25
180	8	15	20	20
200	6	12	12	12
225	5	10	10	10
250	4	8	8	8
280	3	6	6	6
315	3	4	4	4

Permitted starting time
In respect to the temperature rise of the motor, starting time (i.e., from rest to operational speed) should not exceed the time indicated in the following table. Motor must be allowed to cool prior to each start.

		Maximum starting time [sec]			
Frame	Starting method	2 pole	4 pole	6 pole	8 pole
71	D.O.L.	-	26	-	-
80	D.O.L.	15	26	40	-
90	D.O.L.	10	15	25	-
100	D.O.L.	12	13	18	40
112	D.O.L.	10	10	18	35
132	D.O.L.	14	12	12	25
160-355	D.O.L.	15	15	20	20
160-355	star-delta	45	45	60	60

Maintenance instructions

The following maintenance instructions apply to all SGA motors except for hazardous location motors. For **SGAE**, **SGAN** and **SGAD** motors maintenance must be carried out by an authorized service agent. Contact CMG for detailed instructions.

To obtain maximum service life from your electric motor, it is recommended the following maintenance be implemented and recorded in a plant log book.

A. Ensure air intake space is unobstructed.
B. On a weekly basis use an air hose to ensure all airways are clear and free of dust.
C. Do not wash the motor down unless it is **IP66** rated.
D. On a quarterly basis-
  i) Check motor terminals for tightness and contact.
  ii) If terminal lug/lugs are discolored, re-terminate.
  iii) Check operation of starting equipment, ensuring all terminations are tight.
  iv) Check mechanical operation of thermal overload.
  v) Check mechanical operation of thermistor relay (if fitted).
  vi) Check operation of space heaters (if fitted).
E. On a six (6) monthly basis, in addition to the items in 'D' -
  i) Check stator resistance (compare to original and enter in log book)
  ii) Check supply voltage at motor terminals.
  iii) Check bearings for noise/overheating.
F. On an annual basis, in addition to the items in 'D' and 'E'-
  i) Re-grease bearings in line with chart below.
  Note: As indicated in the chart, some bearings may require more frequent grease replacement.
  ii) Strip motor down and clean thoroughly.
  iii) Check bearings for wear/damage - replace as necessary.
  iv) Check all machine bolts for cracks or damage - replace as necessary.
  v) Check all holding bolts for signs of fatigue/damage - replace as necessary.
  vi) After re-assembly, check and record:-
  Full Load Current
  Full Load Voltages
  Full Load Speed
  vii) Ensure cooling fan is operational

G. Ensure plant log book records commissioning data and compare maintenance data with original.

Sealed bearings

The required replacement interval for sealed bearings is generally determined by the grease life which is dependant on operating temperature, operating speed, the limiting speed of the bearing and the type of grease. Under normal operating conditions the following relationship applies:-

$$\log t = 6.54 - 2.6\frac{n}{N} - (0.025 - 0.012\frac{n}{N})T$$

Where:
t = Average grease life (hours)
n = Speed (RPM)
N = Bearing limiting speed with grease lubrication (RPM)
T = Operating temperature (°C)

For further information, please contact your nearest CMG office for advice.

Open (regreasable) bearings

Recommended Grease Replenishment Intervals (Hours)[1)]

Bearing number	Bearing bore [mm]	Qty of grease [g]	3000 r/min		1500 r/min		1000 r/min		750 r/min	
			Ball	Roller	Ball	Roller	Ball	Roller	Ball	Roller
6312/NU312	60	20	3800	1900	10100	5050	16000	8000	20000	10800
6313/NU313	65	25	3400	1700	9400	4700	15100	7500	20000	10300
6314/NU314	70	30	3000	1500	8800	4400	14300	7150	19500	9750
6315/NU315	75	30	2570	1285	8200	4100	13500	6750	18500	9250
6316/NU316	80	35	2200	1100	7600	3800	12800	6400	17700	8850
6317/NU317	85	40	1800	900	7100	3550	12100	6050	16800	8400
6318/NU318	90	45	1650	825	6600	3300	11500	5750	16000	8000
6319/NU319	95	45	1500	750	5700	2850	9000	4500	14600	7300
6322/NU322	110	60	1200	600	4800	2400	8300	4150	13400	6700

[1)] Based on maximum grease service life of 20,000 hours.

It should be noted that for motors fitted with Ball and Roller bearings, the lubrication intervals for both bearings should be based on the roller bearing data.

The re-lubrication intervals recommended are calculated on the basis of normal working conditions.

Note: Air operated grease guns should not be used.

Replenishment of grease media should be by means of a hand held grease gun whilst motor is running with relief plate removed.

Recommended lubricant

Use Lithium based grease such as Shell Alvania R3 unless otherwise specified. (**SGAH**, **SGASS** and **SGAHS** require extra high temperature grease, Magnalube G or equivalent.)

Quality. Integrity. Dependability. Performance. It's been that way for 50 years with CMG. Today these uncompromising standards are still at the core of our ever expanding range of operations. CMG's world's best practices and technologies, plus our national sales, spare parts and service back-up mean we can offer a total commitment to every customer. As depicted in our corporate identity when you think Motors, Transmission, Drives or research and development Technology...think CMG.

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