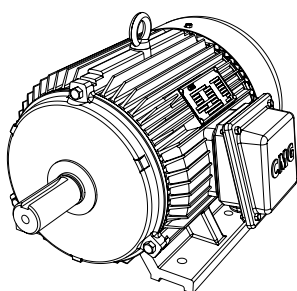


# CMG

SOLUTIONS, not just products

Edition 7 Issue 2



## SGA series motors

Enhanced performance cast iron units



## **SOLUTIONS, not just products**

*Specialists in Electric Motors, Geared Motors & AC Drives*

At CMG we offer customised packages to the most demanding industrial markets. Our success is built on a strong commitment to our customers' needs and a willingness to find the best solution possible. We have been in business since 1948 so you can be confident our expertise and experience is second to none.

With over 650 staff around the globe, our branches extend across Australia, New Zealand, Asia Pacific, South Africa, Europe and the Middle East.

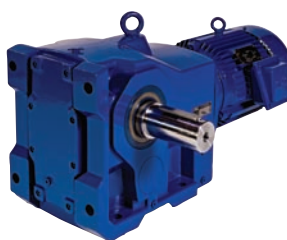
We have the capability to value-add our products through partnerships with leading international companies whose technical skills are equal to ours, including Gear Motors from Reggiana Ridutorri and NORD, and AC Drives from VACON. In return we offer these companies superior technical support that complements their own R&D capabilities.

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***"We specialise in an extensive range of Electric Motors, Geared Motors and AC Drives. Offering a "complete package" ensures our customers get the most efficient, cost effective solution possible."***



➤ **Electric Motors**



➤ **Geared Motors**



➤ **AC Drives**

# SGA enhanced performance cast iron motors

## Sizes 71 to 355, 0.37 to 315kW

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# Introduction

This catalogue details the complete range of CMG SGA series motors. Standard SGA motors are three phase squirrel cage TEFC (Totally Enclosed Fan Cooled), with IEC frame sizes from 71 to 355, with CENELEC frame allocation as standard. They combine 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:

- SGAA** - Alternative frame allocation
- SGAB** - Brake motors
- SGAE** - Hazardous location Ex e
- SGAN** - Hazardous location Ex nA (formerly Ex n)
- SGAD** - Hazardous location Ex tD (formerly DIP)
- SGAS** - Smokespill application (formerly SGASS)
- SGAC** - Cooling tower application (formerly SGACT)
- SGAR** - Airstream rated for Axial flow fans
- SGAP** - Pad mount motors

All units are supplied with F Class 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 also offer motors wound with H Class insulation, and temperature rise still limited to 80K.

- SGAH** - High ambient temperature application
- SGAHS** - H Class smokespill application

Additional protection is provided by installation of thermistors in all units from 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.

## Hazardous area certification

SGA motors in frames 71 to 280 are certified for use in hazardous locations as per IEC Ex and ATEX requirements, with 315 frame certificate pending (Ex nA and Ex tD only).

The following certificates are currently available:

- |             |                    |                     |
|-------------|--------------------|---------------------|
| <b>IEC</b>  | IECEx TSA 06.0034X | Ex e, Ex nA, Ex tD  |
| <b>ATEX</b> | Sira 06ATEX9112X   | EX tD               |
|             | Sira 06ATEX4111X   | Ex nA, Ex nA/ Ex tD |
|             | Sira 06ATEX3110X   | Exe, Ex e/ Ex tD    |

## Standards and specifications

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

## Efficiency

The SGA motor range exceeds requirements of European Eff 2 and correspond to IE1 (Standard Efficiency) of the new international standard IEC 00034-30. For Eff 1 motors, refer to CMG's HGA and PPA series catalogues.

## 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:

<b>M</b>	<b>3</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>5</b>	<b>0</b>	<b>3</b>	<b>S</b>	<b>G</b>	<b>A</b>	<b>E</b>	<b>/</b>	<b>405</b>
1	2	3	4 - 8				9	10 - 12	13...	Suffix				

### Position 1

**M** = metric frame size

### Position 2

#### Winding design

**3** = Standard three phase motors

**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

**F** = 2/6 poles

**M** = 4/12 poles

**4** = 4 poles

**G** = 2/8 poles

**N** = 6/8 poles

**6** = 6 poles

**H** = 2/10 poles

**O** = 6/10 poles

**8** = 8 poles

**I** = 2/12 poles

**P** = 6/12 poles

**A** = 10 poles

**J** = 4/6 poles

**Q** = 8/10 poles

**C** = 12 poles

**K** = 4/8 poles

**R** = 8/12 poles

**E** = 2/4 poles

**L** = 4/10 poles

**S** = 8/16 poles

### Positions 4 to 8

#### Rated power output\*

(kW x 100)

\* Refers to high speed for 2 speed motors

### Position 9

#### Mounting arrangements

**1** = V1

**5** = B5

**8** = B3/B14B

**3** = B3

**6** = B3/B14A

**9** = B14B

**4** = B3/B5

**7** = B14A

**0** = for Pad

Mount only

### Positions 10 to 12

#### Series

**SGA** = CMG SGA series

### Positions 13...\*

#### Series variation

**Blank** = Standard

**G** = Suit NORD gearbox

**1** = High output design

**H** = H Class insulation

**A** = Alternative frame allocation

**L** = LHS terminal box

**B** = Brake motor

**N** = Ex nA

**C** = Cooling tower

**P** = Pad mount

**D** = Ex tD

**R** = Airstream rated

**E** = Ex e

**S** = Smokespill

**F** = Flying leads

**T** = Top terminal box

\* Multiple letters indicate multiple variation.

### Suffix

#### Winding design

**/385** = 380V / 50Hz

**/A05** = 1000V / 50Hz

**/405** = 400V / 50Hz

**/B05** = 1100V / 50Hz

**Blank** = 415V / 50Hz

**/386** = 380V / 60Hz

**/525** = 525V / 50Hz

**/446** = 440V / 60Hz

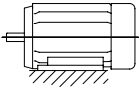
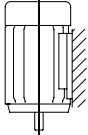
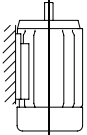



**/695** = 690V / 50Hz

# Mechanical design

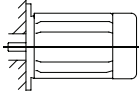
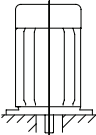
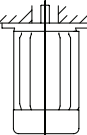
## Mountings

CMG SGA motors are available in the mounting arrangements listed in the table below:

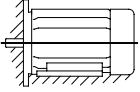
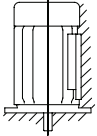
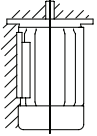
### Foot mount

 B3 (IM1001) [SGA 71 - 355]	 V5 (IM1011) [SGA 71 - 280]	 V6 (IM1031) [SGA 71 - 280]
 B6 (IM1051) [SGA 71 - 180]	 B7 (IM1061) [SGA 71 - 180]	 B8 (IM1071) [SGA 71 - 180]

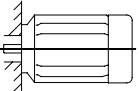
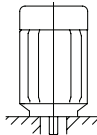
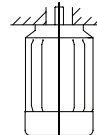
### Large flange

 B5 (IM3001) [SGA 71 - 250]	 V1 (IM3011) [SGA 71 - 355]	 V3 (IM3031) [SGA 71 - 180]
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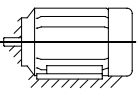
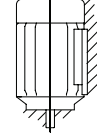
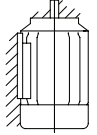
### Large flange and feet

 B3/B5 (IM2001) [SGA 71 - 355]	 V1/V5 (IM2011) [SGA 71 - 180]	 V3/V6 (IM2031) [SGA 71 - 180]
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### Small flange (face)

 B14 (IM3601) [SGA 71 - 160]	 V18 (IM3611) [SGA 71 - 160]	 V19 (IM3631) [SGA 71 - 160]
--	---	---

### Small flange (face) and feet

 B3/B14 (IM2101) [SGA 71 - 160]	 V5/V18 (IM2111) [SGA 71 - 160]	 V6/V19 (IM2131) [SGA 71 - 160]
---	--	--

Note: Bearing arrangement may require review for vertical shaft mounting.

# Protection

## For vertically mounted motors

Motors to be mounted with the shaft vertically down must be provided with a suitable cover (available on request) 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 (refer to Cooling section on page 7).

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 further information.

## 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 IEC or AS60529. The enclosure protection required will depend upon the environmental and operational conditions within which the motor is to operate.

## IP standards explanation

<b>IP</b>	<b>5</b>	<b>5</b>
1-2	3	4

### 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

Second 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

Element	Motor frame size	
	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
Fan cowl	Sheet steel	Sheet steel
Fasteners	Corrosion protected	Corrosion protected

## Shaft

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 IEC 60072-1 and AS1359. Precision grade tolerance is available upon special order.

## Finish

Standard SGA motor color is RAL 7012 Basalt Grey. Other colors are also available. All castings and steel parts are provided with a prime coat of rust-resistant paint.

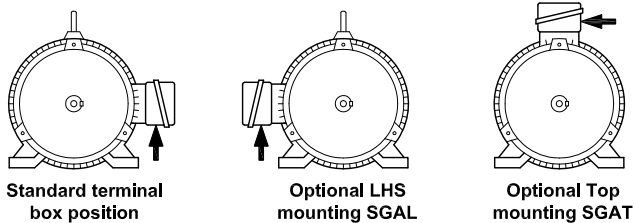
The finishing coat of enamel paint is sufficient for normal conditions, however special paint systems can be provided to accommodate stringent requirements for motors in corrosive environments. Special coatings are needed to resist such substances as acid, salt water and extreme climatic conditions.

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

# Terminal box

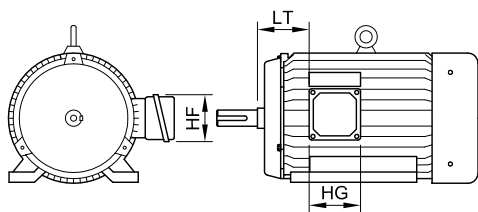
SGA motors have a cast iron terminal box with a one piece nitrile rubber barrier gasket between terminal box and motor, and a flat gasket under the terminal box lid. The earthing arrangement is available within the terminal box.

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.



→ indicates conduit entry position

Conduit entries for motor frame sizes 71 to 280 are provided tapped, 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			Entry/pitch		Number of entries
	HF	HG	LT <sup>1)</sup>	Standard	Alternative*	
71 <sup>2)</sup>	135	127	20	M20 x 1.5	M20 x 1.5	2
80 <sup>3)</sup>	127	135	40	M20 x 1.5	M20 x 1.5	2
90S <sup>3)</sup>	127	135	45	M20 x 1.5	M20 x 1.5	2
90L <sup>3)</sup>	127	135	60	M20 x 1.5	M20 x 1.5	2
100L	135	127	75	M20 x 1.5	M20 x 1.5	2
112M	135	127	80	M25 x 1.5	M25 x 1.5	2
132S	135	127	100	M25 x 1.5	M25 x 1.5	2
132M	135	127	120	M25 x 1.5	M25 x 1.5	2
160M	200	175	65	M32 x 1.5	M25 x 1.5	2
160L	200	175	90	M32 x 1.5	M25 x 1.5	2
180M	200	175	65	M40 x 1.5	M32 x 1.5	2
180L	200	175	65	M40 x 1.5	M32 x 1.5	2
200	240	195	55	M50 x 1.5	M32 x 1.5	2
225	240	195	90	M50 x 1.5	M40 x 1.5	2
250	270	235	95	M50 x 1.5	M40 x 1.5	2
280	270	235	90	M50 x 1.5	M50 x 1.5	2
315	355	300	90	10 mm Gland plate	M63 x 1.5	Nii/2
355	355	300	125	10 mm Gland plate	M63 x 1.5	Nii/2

\* Supplied as standard in South Africa.

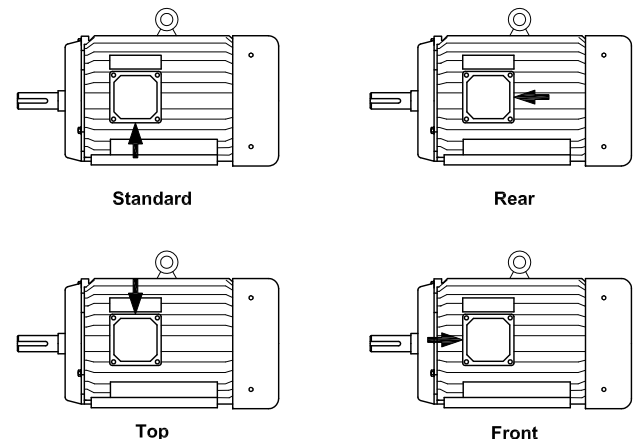
<sup>1)</sup> Dimension LT should be confirmed for SGAL motors.

<sup>2)</sup> Frame 71 only available with top mounted terminal box.

<sup>3)</sup> Conduit entry faces to rear of motor for frames 80 & 90.

For details of motors fitted with extended leads please refer to page 33.

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



**SGA** - Standard<sup>2)3)</sup>

**SGAR** - Rear

**SGAT** - From RHS when viewed from drive end

<sup>2)</sup> Frame 71 only available with top mounted terminal box.

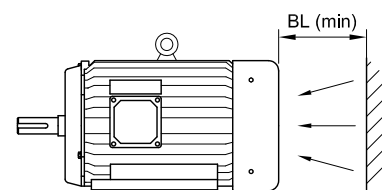
<sup>3)</sup> Conduit entry faces to rear of motor for frames 80 & 90.

## Cooling

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 IC0141 of IEC 60034-6 and AS1359.106.

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

\* SGAA D-end bearing = NU6315

## 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. SGAAH, SGAS and SGAAHS motors use Magnalube G grease.

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

\* SGAA D-end bearing = 6315



## Recommended Grease Replenishment Intervals (Hours) <sup>1)</sup>

Bearing number <sup>2)</sup>	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

<sup>1)</sup> Based on maximum grease service life of 20,000 hours    <sup>2)</sup> Refer to Nameplate / Motor to confirm Bearing size.

## Vibration, balancing and noise

### Vibration

SGA motors fall within the limits of vibration severity set out in standard IEC 60034-14 which are listed below. As specified in the standard, these values relate to rotating machinery measured in soft suspension.

### Vibration severity limit, Level N

Motor frame	Maximum RMS vibration velocity [ mm/s ]
71	1.6
80	1.6
90	1.6
100	1.6
112	1.6
132	1.6
160	2.2
180	2.2
200	2.2
225	2.2
250	2.2
280	2.2
315	2.8
355	2.8

### Balancing

Rotors have been dynamically balanced with a half key. Pulleys or couplings used with motors must also be appropriately balanced.

### Noise

Noise levels for SGA motors comply with limits set by IEC 60034.9 and AS1359.109. SGA sound pressure levels at 1 metre (Data relates to motors tested at no load) are set out in the table (above right).

### Sound pressure level

Output [ kW ]	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
3.0	72	63	64	59
4.0	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	67
18.5	80	74	70	67
22	85	74	70	68
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	-
250	95	92	88	-
315	95	92	-	-

# Electrical design

As standard, SGA 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, 415V, 50Hz
- Ambient cooling air temperature, 40°C
- Altitude - 1000m
- 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 415V, 50Hz. Motors can be manufactured for any supply between 100V and 1100V and frequencies other than 50Hz. Standard SGA motors wound for a certain voltage at 50Hz can also operate at other voltages at 50Hz and 60Hz without modification, subject to the changes in their data (see table right).

Motor wound for 50Hz at rated voltage -	Connected to	Data <sup>9)</sup> in percentage of values at 50Hz and rated voltage							
		Output	r/min	I <sub>N</sub>	I <sub>L</sub> /I <sub>N</sub>	T <sub>N</sub>	T <sub>L</sub> /T <sub>N</sub>	T <sub>B</sub> /T <sub>N</sub>	
380V	400V 50Hz	100	100	95	110	100	110	110	
	380V 60Hz	100	120	98	83	83	70	85	
	400V 60Hz	105	120	98	90	87	80	90	
	415V 60Hz	110	120	98	95	91	85	93	
	440V 60Hz	115	120	100	100	96	95	98	
	460V 60Hz	120	120	100	105	100	100	103	
400V	380V 50Hz	100	100	105	91	100	90	90	
	415V 50Hz	100	100	96	108	100	108	108	
	400V 60Hz	100	120	98	83	83	70	85	
	415V 60Hz	104	120	98	89	86	75	88	
	440V 60Hz	110	120	98	95	91	85	93	
	460V 60Hz	115	120	100	100	96	93	98	
	480V 60Hz	120	120	100	105	100	100	103	
	415V	380V 50Hz*	100	100	109	84	100	84	84
415V	400V 50Hz	100	100	104	93	100	93	93	
	440V 50Hz	100	100	94	112	100	112	112	
	415V 60Hz	100	120	98	83	83	70	85	
	440V 60Hz	105	120	98	90	87	80	90	
	460V 60Hz	110	120	98	95	91	85	94	
	480V 60Hz	115	120	100	100	96	95	98	
525V	550V 50Hz	100	100	95	110	100	110	110	
	525V 60Hz	100	120	98	83	83	70	85	
	550V 60Hz	105	120	98	90	87	80	90	
	575V 60Hz	110	120	98	95	91	85	94	
	600V 60Hz	115	120	100	100	96	95	98	

\* Not applicable for motors with F class temperature rise.  
Note: This table is not applicable for hazardous area motors.

- <sup>1)</sup> I<sub>N</sub> = Full load current      T<sub>N</sub> = Full load torque  
 I<sub>L</sub>/I<sub>N</sub> = Locked rotor current/ full load current      T<sub>L</sub>/T<sub>N</sub> = Locked rotor torque/ full load torque  
 T<sub>B</sub>/T<sub>N</sub> = Breakdown torque/full load torque

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 415V motors except for the currents which are calculated with the accompanying formula:

$$I_x = \frac{415 \times I_N}{U_x}$$

Where:

- I<sub>x</sub> = Current
- I<sub>N</sub> = Full load current at 415 volt
- U<sub>x</sub> = Design voltage

## Temperature and altitude

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

Ambient temperature	Temperature factor	Altitude above sea level	Altitude factor
30°C	1.06	1000m	1.00
35°C	1.03	1500m	0.98
40°C	1.00	2000m	0.94
45°C	0.97	2500m	0.91
50°C	0.93	3000m	0.87
55°C	0.88	3500m	0.82
60°C	0.82	4000m	0.77

$$\text{Effective Power} = \text{Rated Power} \times \text{Temperature Factor} \times \text{Altitude Factor}$$

### Example 1

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

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

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

### Example 2

Rated power = 11kW  
 Air temperature = 50°C (factor 0.93)  
 Altitude = 1500 metres (factor 0.98)

$$\text{Effective Power} = 11 \times 0.93 \times 0.98 = 10.0\text{kW}$$

## 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.

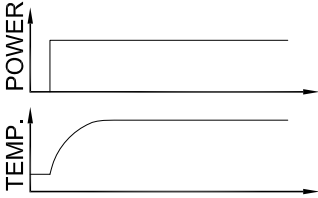
		Duty cycle factor		
		For frames 80 to 132	For frames 160 to 250	For frames 280 to 355
Poles				
<b>Short-time duty, S2</b>				
30 min	2	1.05	1.20	1.20
	4 to 8	1.10	1.20	1.20
60 min	2 to 8	1.00	1.10	1.10
<b>Intermittent duty, S3</b>				
15%	2	1.15	1.45	1.40
	4 to 8	1.40	1.40	1.40
25%	2	1.10	1.30	1.30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

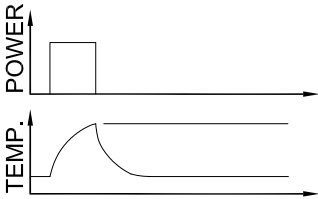
### S1 Continuous duty

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



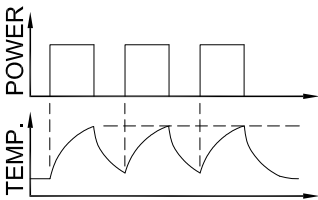
### S2 Short - time duty

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.



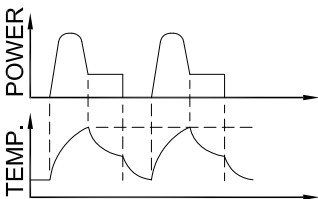
### S3 Intermittent periodic duty with insignificant starting time

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.



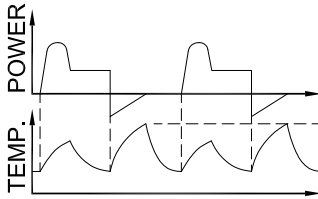
### S4 Intermittent periodic duty with significant starting time

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.



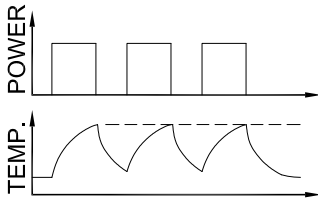
### S5 Intermittent periodic duty with influence of running up period and electric braking

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



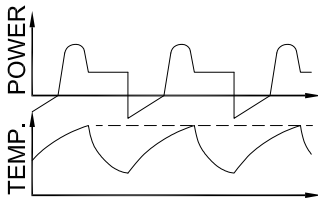
### S6 Continuous periodic duty

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

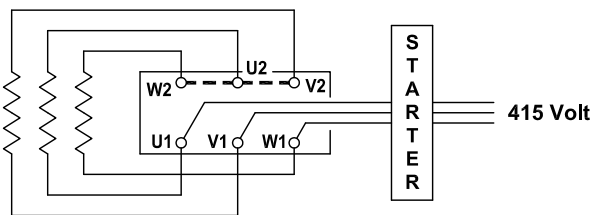
A motor's rated voltage must agree with the power supply line-to-line voltage. Care must therefore be taken to ensure the correct connection to the motor terminals.

## Internal connections, voltages and VF drive selection

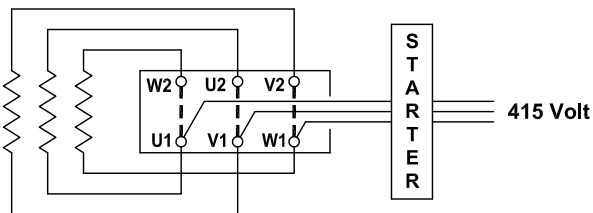
Standard terminal connections for motors 3.0kW and below is 240V delta / 415V star. These motors are designed for 415V Direct On Line (D.O.L.) starting, when connected in the star configuration. They are also suitable for operation with 240V three phase variable frequency drives, when connected in the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

Standard terminal connections for motors 4.0kW and above is 415V delta / 720V star. These motors are designed for 415V Direct On Line (D.O.L.) starting, when connected in the delta configuration. They are also suitable for operation with 415V three phase variable frequency drives. Alternatively they can be operated D.O.L. in the star configuration from a 720V supply or with a 720V 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 415V 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 torque is not required, it is preferable to reduce the starting current by one of the following means.

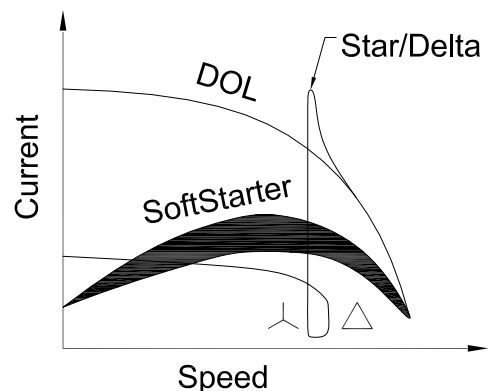
## Star - Delta starting

SGA motors 4.0kW 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. By limiting the rate of the current increase the startup time is extended. This starting method is particularly suitable for centrifugal loads (fans and pumps).



## VVVF Drives

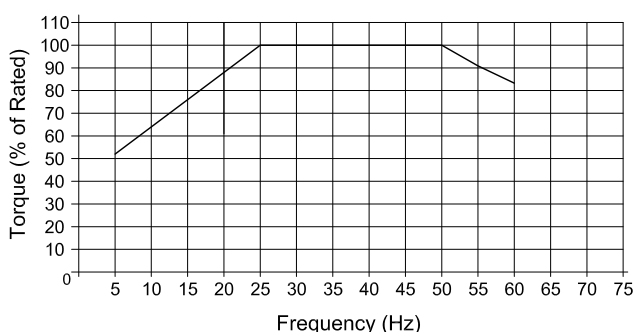
The SGA motor performs excellently without cogging at low speed when operating in conjunction with a VVVF (Variable Voltage Variable Frequency) drive. VVVF drives are primarily recognized for their ability to manipulate power from a constant 3 phase 50/60Hz supply converting it to variable voltage and variable frequency power. This enables the speed of the 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 offers a simple and repeatable method of changing speeds or flow rates.

For operation below 25Hz motor cooling fan efficiency drops significantly. Hence, in constant torque applications, a separately driven cooling fan should be fitted to provide sufficient cooling of the motor.

For operation between 25Hz and 50Hz speed range the motor is capable of delivering full rated torque with its standard fan.

For operation above 50Hz, all SGA motors are capable of delivering constant rated power up to 60Hz. However, most of these motors are suitable to run and deliver constant power at much higher frequencies than 60Hz to a maximum of 100Hz. In the case of applications between 60Hz and 100Hz please contact CMG for advice on suitability.

The SGA range of motors will operate without modification on VVVF drives however under certain conditions additional features should be considered (see EDM Concerns). The graph below shows the SGA motors' loadability with a frequency converter:



## EDM concerns

Capacitive voltages in the rotor can be generated due to an effect caused by harmonics in the waveform causing voltage discharge to earth through the bearings. This discharge results in etching of the bearing running surfaces. This effect is known as Electrical Discharge Machining (EDM). It can be controlled with the fitment of appropriate filters to the drive.

To further reduce the effect of EDM, an insulated non drive bearing can be used. CMG recommends the use of insulated bearings for all motors 315 frame and above.

## Insulation

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

	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

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.

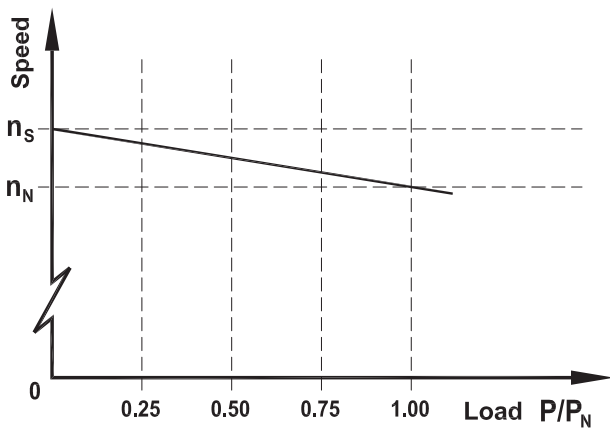
## Thermal protection

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 thermovisible 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.



Where:

- $n_N$  = full load speed
- $n_s$  = synchronous speed
- $P/P_N$  = partial load factor

## Current at partial loads

Current at partial loads can be calculated using the following formula:

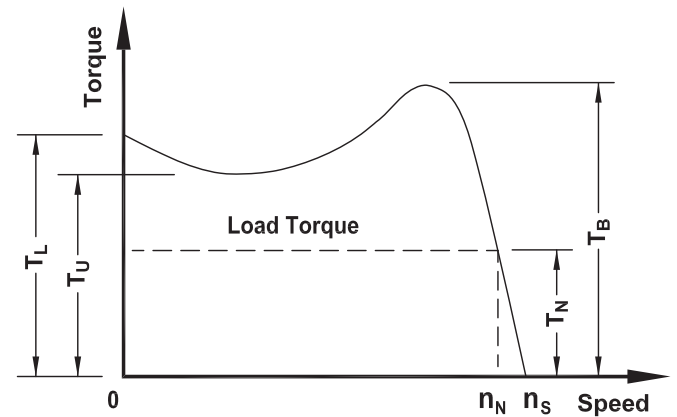
$$I_x = \frac{P_{out_x}}{\sqrt{3} \times U_N \times \cos \phi_x \times \eta_x} \times 10^5$$

Where:

- $I_x$  = partial load current (amps)
- $P_{out_x}$  = partial load (kW)
- $U_N$  = rated voltage
- $\cos \phi_x$  = partial load power factor
- $\eta_x$  = partial load efficiency (%)

## Torque characteristics

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



Where:

- $T_N$  = full load torque
- $T_L$  = locked rotor torque
- $T_U$  = pull-up torque
- $T_B$  = break down torque
- $n_N$  = full load speed
- $n_s$  = synchronous speed

SGA motors all exceed the minimum starting torque requirements for Design N (Normal torque) as specified in IEC60034-12, and in most cases meet the requirements of Design H (High torque).

Rated torque can be calculated with the following formula:

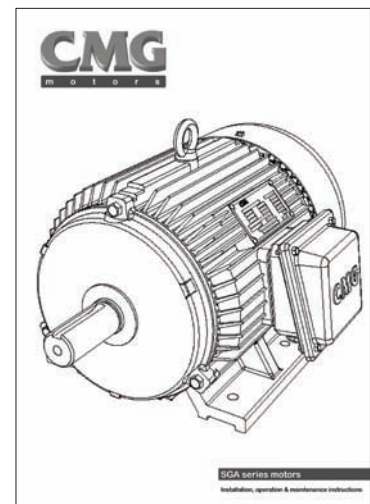
$$T_N = \frac{9550 \times P_N}{n_N}$$

Where:

- $T_N$  = full load torque (Nm)
- $P_N$  = full load output power (kW)
- $n_N$  = full load speed (r/min)

## Installation, operation & maintenance

For a copy of the SGA Installation, Operation & Maintenance manual, please contact CMG or download from our website at [www.cmgroup.com.au](http://www.cmgroup.com.au).



# Installation, operation & maintenance

The CMG SGA series motors are designed and manufactured to be robust and reliable with minimal maintenance. The following items should be taken into consideration to ensure a trouble free installation and reliable running throughout the motor's life.

## Inspection

CMG motors are delivered through safe and reliable transport in appropriate packing as to remain in as manufactured condition during transit. On receipt of the motor thoroughly inspect the unit for any transit damage, if need be in the presence of an insurance surveyor. Any equipment damage or shortfall should be immediately advised to the nearest CMG office.

Check the following:

- rating plate details and enclosure are as ordered,
- shaft turns freely (in absence of shaft locking clamp),
- condensation drain holes are in the correct position for the motor mounting application (they should be located at the lowest point of the motor when it is in its operating position),
- If the winding is Insulation Resistance (IR) tested to earth, ensure that the thermal protectors are not inadvertently damaged. (The thermistor leads should be shorted together whilst IR testing takes place.)

## Storage

When the motor is not for immediate use store as follows:

- Clean and dry location,
- Free from vibration (vibration can damage bearings),
- Shaft locking clamps, where supplied, are fitted securely,
- Remove shaft locking clamps and turn rotor by one full rotation at least once a fortnight and replace shaft locking clamps,
- Anti-condensation heaters, where fitted, should be energised if the environment is likely to be damp.

## Installation

The following items should be considered on installation to ensure reliable operation of the motor:

### Surroundings

- Ensure that the motor is properly protected against ingress of oil, water or dust especially if construction work is in progress around the motor,
- Ensure air intake is not obstructed. Refer to dimension BL in the catalogue,
- When installing hazardous location motors, make sure that the zone and gas group or dust and temperature classification on motor nameplate are complied with.

## Mounting

- 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 fixing screws,
- 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.

## Operation

- Before running the motor make sure that the terminal box lid is closed and secured with appropriate clearance to live parts,
- Make sure that appropriate earthing is done,
- Make sure that the coupling and/or transmission is adequately guarded for safety,
- Check the mounting bolts and/or flanges are firmly secured,
- Make sure of no loose objects around that may be sucked by the cooling fan on the motor,
- Make sure that the load applied is within the nameplate specification,
- Make sure that the ambient temperature is inside 40°C or nameplate specification,
- Avoid frequent starting of motor. Refer to motor catalogue or nearest CMG office for recommendation on frequency and duration of starts,
- If a VVVF drive is used on Ex nA motor, make sure that the applied load is inside the limits specified by the loadability curve shown in drawing SGA208,
- On Ex e motors, make sure that the starting method employed keeps the starting current and duration within the nameplate figures of  $I_A/I_N$  ratio and  $t_E$  time,
- Check that the running current on no load and full load are reasonably balanced within 10% of the average and record the figures in the log book for future reference. Note that the current imbalance can be higher, typically 10 times the voltage imbalance if there is an imbalance in supply voltage,
- Brake motors used in hazardous locations must have a limited number of repeat stops to 20 per hour.



## 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.

Frame	Starts per Hour			
	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

\* 20 Starts / Hour for Ex tD brake Motors

## 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.

Note: For Ex e motors  $t_E$  time stated on motor name plate takes precedence over these times

Frame	Starting method	Maximum starting time [sec]			
		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

## 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

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: Under arduous conditions please contact CMG or the bearing manufacturers catalogue. 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.

# Maintenance

Reliable, trouble free operation of a motor needs regular maintenance. Exact maintenance needs vary based on the site conditions. To obtain reliable service from the motor, the following maintenance schedule may be used as a guide. An authorised service agent must carry out maintenance of hazardous location motors SGAE, SGAN or SGAD.

- A. Ensure air intake space is unobstructed.
- B. On a weekly basis use an air hose to ensure all air ways are clear and free of dust.
- C. Once every month, check motor for condensation. Replace drain plugs before starting if they are blocked or found missing.
- D. Do not wash the motor down unless it is IP66 rated.
- E. On a quarterly basis-
  - (i) Check the motor terminals for tightness and proper contact,
  - (ii) If terminal lug/s are discoloured, re-terminate with fresh lugs,
  - (iii) Check operation of starting equipment, ensuring all terminations are tight.
  - (iv) Check mechanical operation of thermal overload relays, if any,
  - (v) Check mechanical operation of thermistor relays, if fitted,
  - (vi) Check operation of anti-condensation heaters, if fitted.
- F. On a six monthly basis, in addition to the items in 'E' -
  - (i) Check winding resistance between supply terminals and compare to original value and enter in log book.
  - (ii) Check supply voltage at motor terminals and record in log book.
  - (iii) Check bearings for abnormal noise/overheating.
- G. On an annual basis, in addition to the items in 'E' and 'F' -
  - (i) Re-grease the bearings as recommended in the following table. Frames 71-180 use sealed bearings. Frames 200-280 use open re-greasable bearings. When re-greasing bearings ensure that the correct type of grease is used. If in doubt about the existing grease type, clean out the old grease thoroughly from bearings and bearing housings, prior to regreasing.  
**WARNING: NEVER MIX GREASE OF DIFFERENT TYPES**  
Use lithium based grease such as Shell Alvania R3 or equivalent unless otherwise specified. SGAH, SGASS and SGASHS motors require extra high temperature grease such as Magnalube G or equivalent.
  - (ii) Completely disassemble stator, rotor apart and clean thoroughly.
  - (iii) Check bearings for wear/damage – replace as necessary.
  - (iv) Check all bolts and nuts for cracks or damage – replace as necessary.
  - (v) Check all holding down bolts for signs of fatigue or damage – replace as necessary.
  - (vi) After re-assembly, check and record in the log book-  
Insulation resistance by megger  
No load current and voltages  
Full load current and voltages  
Ensure that these figures compare well with the original records in the log book.
  - (vii) Check and ensure that the cooling fan is operational.

# Marine Approval

The complete range of SGA series standard motors are Lloyds Registered (Certificate No. 08/10039) for use in marine, offshore and industrial applications.

SGA motors as detailed in this catalogue are designed and rated for use on board merchant vessels and are generally in accordance with the requirements of major marine classification authorities.

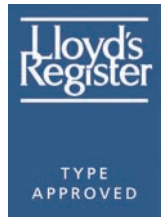
## Registered Range:

Output: 0.37kW to 315kW  
 Speed: 2P, 4P, 6P, 8P & dual speed  
 Voltage: 200V to 750V  
 Frequency: 50Hz to 60Hz  
 Ambient Temperature: 450 C  
 IP Rating: IP55

Design Code Standard: IEC60034-1 & IEC60092-301

## Available Options

- IP56 or IP66
- Epoxy paint finish
- Class H insulation
- Thermistors
- Anti-condensation heaters
- Winding RTD's
- Bearing RTD's
- Drain plugs
- Special shaft material or shaft design
- Stainless steel fasteners
- VVVF drive compatible



Standards for TEFC motors					
Classifying Authority	Service	Ambient temp °C	Permissible temp rise K		Witnessed tests for essential service
			Class B	Class F	
Lloyds Register of Shipping (LRS)	Restricted	40	75	90	≤ 100kW
	Unrestricted	45	70	90	
Det Norske Veritas (DNV)	Restricted	35*	80	100	≤ 100kW
	Unrestricted	45	70		
Germanischer Lloyd (GL)	Restricted	40	80	100	≤ 100kW
	Unrestricted	45	75	95	
American Bureau of Shipping (ABS)	Non-essential	40	80	105	≤ 100kW
	Essential	50	70	95	
Korean Register of Shipping (KRS)	Essential and non-essential	50	70	90	All motors
Chinese Classification Societies (CCS)	Essential and non-essential	50	70	90	**
	Auxiliaries	45	75	95	**
Bureau Veritas (BV)		40	80	100	≤ 100kW
	Essential	50	70	90	
Registro Italiano Navale (RINA)	Non-essential	40	80	100	≤ 100kW
	Essential	50	70	90	
Nippon Kaiji Kyokai (NKK)	Essential and non-essential	45	75	95	All motors

\* Refrigerated holds only

\*\* Refer to CMG - discretionary upon requirements

The table above gives a list for some of the major marine certifying authorities and details a summary of their specific requirements. Please use table as a guide only.

# Performance data

SGA series, three phase 415V 50Hz

IP55, F class insulation, B class temperature rise

kW	Motor frame	Speed [ r/min ]	Efficiency %				Power factor, cos φ				Current			Torque			Moment of inertia J=¼GD <sup>2</sup> [ kg m <sup>2</sup> ]	Weight of foot mount motor [ kg ]	
			at % full load				at % full load				Full load I <sub>N</sub> [ A ]	Locked rotor I <sub>L</sub> /I <sub>N</sub>	t <sub>E</sub> time <sup>2)</sup> [ sec ]	Full load T <sub>N</sub> [ Nm ]	Locked rotor T <sub>L</sub> /T <sub>N</sub>	Break down T <sub>B</sub> /T <sub>N</sub>			
<b>3000 r/min = 2 poles - CENELEC frame allocations</b>																			
0.75	80 A	-19	2820	74.4	76.0	75.8	72.5	0.88	0.84	0.78	0.67	1.61	6.1	17	2.5	2.8	4.0	0.001	18
1.1	80 B	-19	2835	76.7	78.5	79.2	77.2	0.89	0.86	0.82	0.72	2.3	5.9	11	3.7	2.7	3.0	0.001	19
1.5	90 S	-24	2860	79.3	80.5	80.4	77.6	0.88	0.85	0.80	0.70	3.0	6.7	11	5.0	2.9	3.5	0.001	22
2.2	90 L	-24	2830	79.5	81.8	82.8	81.6	0.90	0.87	0.83	0.74	4.3	6.4	6	7.4	2.8	2.8	0.001	26
3	100 L	-28	2870	82.0	83.3	83.3	81.2	0.90	0.88	0.84	0.76	5.7	7.5	7	10.0	2.8	3.4	0.003	36
4	112 M	-28	2900	85.3	86.1	86.1	84.2	0.90	0.89	0.84	0.75	7.4	7.9	7	13.2	2.7	3.5	0.006	45
5.5	132SA	-38	2925	86.7	86.8	86.0	81.7	0.89	0.87	0.82	0.69	10.2	7.0	11	18.0	2.4	2.3	0.011	70
7.5	132 SB	-38	2895	86.0	87.0	87.2	85.5	0.91	0.91	0.89	0.84	13.3	7.2	7	24.7	2.1	2.8	0.013	77
11	160 MA	-42	2935	88.3	88.4	87.4	85.4	0.89	0.89	0.87	0.83	19.6	7.0	25	35.8	2.2	2.9	0.038	122
15	160 MB	-42	2940	89.4	89.8	89.6	87.3	0.92	0.91	0.92	0.83	25.4	7.2	10	48.7	1.8	2.6	0.050	132
18.5	160 L	-42	2930	90.1	90.4	90.1	88.5	0.91	0.91	0.90	0.87	31.4	7.3	10	60.3	2.3	2.9	0.055	150
22	180 M	-48	2945	90.3	90.6	89.9	89.0	0.91	0.92	0.88	0.86	36.6	6.8	7	71.3	2.3	2.4	0.075	182
30	200 LA	-55	2960	92.6	92.6	92.0	90.2	0.90	0.90	0.89	0.82	49.8	4.7	7	96.8	2.4	3.3	0.124	240
37	200 LB	-55	2960	92.6	92.6	92.0	90.0	0.90	0.89	0.87	0.80	62	7.6	10	119	2.4	3.1	0.139	260
45	225 M	-55	2975	93.3	93.0	92.3	90.2	0.90	0.89	0.88	0.83	75	8.3	17	144	2.6	2.9	0.233	325
55	250 M	-60	2975	93.7	93.4	92.6	90.4	0.90	0.89	0.88	0.82	92	8.5	17	177	2.6	3.2	0.312	405
75	280S	-65	2975	94.5	94.4	93.9	92.3	0.91	0.91	0.90	0.88	122	7.5	15	241	2.7	3.0	0.597	550
90	280 M	-65	2980	94.7	94.7	94.2	92.1	0.91	0.92	0.91	0.88	144	7.9	12	288	2.8	3.1	0.675	610
110	315S	-65	2980	95.0	94.7	93.9	92.0	0.89	0.89	0.88	0.84	181	6.6	-	353	2.5	3.0	1.18	980
132	315 MA	-65	2980	95.5	95.3	94.6	93.0	0.90	0.91	0.89	0.87	213	7.0	-	423	2.6	2.9	1.82	1080
160	315 LA	-65	2980	95.7	95.5	94.9	93.6	0.88	0.90	0.89	0.86	259	6.4	-	513	2.4	2.9	2.08	1160
200	315 LB	-65	2980	95.8	95.5	95.0	93.4	0.91	0.87	0.86	0.80	334	6.6	-	641	2.6	2.9	2.38	1210
220 <sup>3)</sup>	315 LC	-65	2980	95.8	95.6	95.2	93.7	0.92	0.88	0.86	0.81	361	6.1	-	705	2.3	2.6	2.45	1250
250 <sup>3)</sup>	355 MB	-75	2985	94.5	94.5	94.0	92.5	0.90	0.90	0.88	0.81	407	6.8	-	800	1.7	3.1	3.00	1770
315 <sup>3)</sup>	355 LB	-75	2985	94.8	94.1	92.8	90.2	0.88	0.88	0.86	0.80	530	8.1	-	1008	2.8	3.0	3.50	1900
<b>High Output Design - CENELEC +1 frame allocations (SGA1)<sup>4)</sup></b>																			
4	100LB	-28	2875	83.1	84.5	84.5	83.2	0.89	0.87	0.83	0.74	7.6	8.1	-	13.3	3.3	3.1	0.004	39
5.5	112MB	-28	2890	85.4	86.4	86.4	84.7	0.91	0.89	0.86	0.78	9.9	7.8	-	18.2	2.8	3.4	0.011	70
11 <sup>3)</sup>	132M	-38	2900	87.7	88.8	89.1	87.9	0.92	0.92	0.91	0.87	18.8	7.3	-	36.2	2.0	2.9	0.015	74
22	160L	-42	2925	91.0	91.6	91.6	90.6	0.91	0.91	0.91	0.87	36.6	7.8	-	71.8	2.3	2.7	0.066	157
45	200L	-55	2955	93.0	93.2	92.8	91.3	0.90	0.89	0.86	0.79	76	8.6	-	145	2.8	3.1	0.167	275
75 <sup>3)</sup>	250MB	-60	2970	93.9	93.8	93.4	92.4	0.91	0.91	0.88	0.84	123	7.0	-	241	2.1	2.3	0.426	430
110 <sup>3)</sup>	280MB	-65	2978	94.5	94.6	94.2	93.0	0.90	0.89	0.86	0.78	182	8.2	-	353	3.2	3.4	0.825	670
<b>Alternative frame allocations (SGAA)<sup>3)</sup></b>																			
55	250SM	-60	2975	93.7	93.4	92.6	90.4	0.90	0.89	0.88	0.82	92	8.5	17	177	2.6	3.2	0.312	405
75	250SM	-60	2970	93.9	93.8	93.4	92.4	0.91	0.91	0.88	0.84	123	7.0	-	241	2.1	2.3	0.426	430
90	280SM	-65	2980	94.7	94.7	94.2	92.1	0.91	0.92	0.91	0.88	144	7.9	12	288	2.8	3.1	0.675	610
110	280SM	-65	2978	94.5	94.6	94.2	93.0	0.90	0.89	0.86	0.78	182	8.2	-	353	3.2	3.4	0.825	670
132	315SM	-65	2980	95.5	95.3	94.6	93.0	0.90	0.91	0.89	0.87	213	7.0	-	423	2.6	2.9	1.82	1080
160	315ML	-65	2980	95.7	95.5	94.9	93.6	0.88	0.90	0.89	0.86	259	6.4	-	513	2.4	2.9	2.08	1160
200	315ML	-70	2980	95.8	95.5	95.0	93.4	0.91	0.87	0.86	0.80	334	6.6	-	641	2.6	2.9	2.38	1210
220	315ML	-70	2980	95.8	95.6	95.2	93.7	0.92	0.88	0.86	0.81	361	6.1	-	705	2.3	2.6	2.45	1250

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

<sup>1)</sup> F Class temperature rise

<sup>2)</sup> t<sub>E</sub> time applies to Ex e motors only and is explained in the hazardous areas section.

<sup>3)</sup> The SGAA series are supplied as standard in South Africa.

<sup>4)</sup> The output of these motors is one step higher than the basic design with rated outputs in accordance with CENELEC.



# Full load currents at various power supplies

SGA series, three phase

Specifically wound for nominated power supply

kW	Motor frame	Current								Current		Speed 60Hz [ r/min ]
		Full load I <sub>N</sub> 50Hz								Full load I <sub>N</sub> 60Hz		
		380V [A]	400V [A]	415V [A]	525V [A]	690V [A]	1000V [A]	1100V [A]	380V [A]	440V [A]		
<b>3000\3600 r/min = 2 poles - CENELEC frame allocations</b>												
0.75	80 A	-19	1.76	1.67	1.61	1.27	0.97	0.67	0.61	1.76	1.52	3384
1.1	80 B	-19	2.5	2.4	2.3	1.80	1.37	0.95	0.86	2.5	2.2	3402
1.5	90 S	-24	3.3	3.1	3.0	2.4	1.80	1.25	1.13	3.3	2.8	3432
2.2	90 L	-24	4.7	4.5	4.3	3.4	2.6	1.78	1.62	4.7	4.0	3396
3	100 L	-28	6.2	5.9	5.7	4.5	3.4	2.4	2.2	6.2	5.4	3444
4	112 M	-28	8.0	7.6	7.4	5.8	4.4	3.1	2.8	8.0	6.9	3480
5.5	132SA	-38	11.1	10.6	10.2	8.1	6.1	4.2	3.8	11.1	9.6	3510
7.5	132 SB	-38	14.5	13.8	13.3	10.5	8.0	5.5	5.0	14.5	12.5	3474
11	160 MA	-42	21.4	20.3	19.6	15.5	11.8	8.1	7.4	21.4	18.5	3522
15	160 MB	-42	27.7	26.4	25.4	20.1	15.3	10.5	9.6	27.7	24.0	3528
18.5	160 L	-42	34.3	32.6	31.4	24.8	18.9	13.0	11.8	34.3	29.6	3516
22	180 M	-48	40.0	38.0	36.6	28.9	22.0	15.2	13.8	40.0	34.5	3534
30	200 LA	-55	54	52	49.8	39.4	30.0	20.7	18.8	54	47.0	3552
37	200 LB	-55	68	65	62	49.3	37.5	25.9	23.5	68	59	3552
45	225 M	-55	82	78	75	59	45.2	31.2	28.4	82	71	3570
55	250 M	-60	100	95	92	72	55	38.1	34.6	100	86	3570
75	280S	-65	133	126	122	96	73	50	45.8	133	115	3570
90	280 M	-65	157	149	144	114	87	60	54	157	136	3576
110	315S	-65	198	188	181	143	109	75	68	198	171	3576
132	315 MA	-65	232	221	213	168	128	88	80	232	201	3576
160	315 LA	-65	283	269	259	205	156	108	98	283	244	3576
200	315 LB	-65	364	346	334	264	201	138	126	364	315	3576
220 <sup>0</sup>	315 LC	-65	394	375	361	285	217	150	136	394	340	3576
250 <sup>0</sup>	355 MB	-75	444	422	407	322	245	169	154	444	384	3582
315 <sup>0</sup>	355 LB	-75	579	550	530	419	319	220	200	579	500	3582
<b>High Output Design - CENELEC +1 frame allocations (SGA1)<sup>4)</sup></b>												
4	100LB	-28	8.3	7.9	7.6	6.0	4.6	3.2	2.9	8.3	7.2	3450
5.5	112MB	-28	10.8	10.3	9.9	7.8	5.9	4.1	3.7	10.8	9.3	3468
11 <sup>0</sup>	132M	-38	20.5	19.5	18.8	14.9	11.3	7.8	7.1	20.5	17.7	3480
22	160L	-42	40.0	38.0	36.6	28.9	22.0	15.2	13.8	40.0	34.5	3510
45	200L	-55	83	79	76	60	45.7	31.5	28.7	83	72	3546
75 <sup>0</sup>	250MB	-60	134	127	123	97	74	51	46.2	134	116	3564
110 <sup>0</sup>	280MB	-65	199	189	182	144	109	76	69	199	172	3574
<b>Alternative frame allocations (SGAA)<sup>3)</sup></b>												
55	250SM	-60	100	95	92	72	55	38.1	34.6	100	86	3570
75	250SM	-60	134	127	123	97	74	51	46.2	134	116	3564
90	280SM	-65	157	149	144	114	87	60	54	157	136	3576
110	280SM	-65	199	189	182	144	109	76	69	199	172	3574
132	315SM	-65	232	221	213	168	128	88	80	232	201	3576
160	315ML	-65	283	269	259	205	156	108	98	283	244	3576
200	315ML	-70	364	346	334	264	201	138	126	364	315	3576
220	315ML	-70	394	375	361	285	217	150	136	394	340	3576

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

# Performance data

SGA series, three phase 415V 50Hz

IP55, F class insulation, B class temperature rise

kW	Motor frame	Speed [ r/min ]	Efficiency %				Power factor, cos $\phi$				Current			Torque			Moment of inertia J=¼GD <sup>2</sup> [ kg m <sup>2</sup> ]	Weight of foot mount motor [ kg ]	
			at % full load				at % full load				Full load I <sub>N</sub> [ A ]	Locked rotor I <sub>L</sub> /I <sub>N</sub>	t <sub>E</sub> time <sup>2)</sup> [ sec ]	Full load T <sub>N</sub> [ Nm ]	Locked rotor T <sub>L</sub> /T <sub>N</sub>	Break down T <sub>B</sub> /T <sub>N</sub>			
<b>1500 r/min = 4 poles - CENELEC frame allocations</b>																			
0.37	71B	-14	1375	70.4	72.2	71.6	67.5	0.76	0.69	0.59	0.46	1.05	4.5	35	2.6	3.3	2.7	0.001	15
0.55	80 A	-19	1390	71.0	72.1	72.2	68.5	0.80	0.75	0.67	0.54	1.40	4.8	25	3.8	2.5	2.6	0.002	19
0.75	80 B	-19	1405	73.7	75.7	75.9	73.3	0.81	0.76	0.68	0.55	1.80	5.0	24	5.1	2.4	2.5	0.002	20
1.1	90 S	-24	1410	75.2	77.4	77.9	75.1	0.83	0.78	0.71	0.58	2.5	5.4	10	7.4	2.8	2.4	0.002	25
1.5	90 L	-24	1405	76.7	79.4	80.7	79.8	0.87	0.85	0.81	0.72	3.2	5.7	12	10.2	1.8	2.4	0.003	28
2.2	100 LA	-28	1430	81.4	82.6	82.9	81.2	0.86	0.83	0.76	0.65	4.5	6.6	11	14.7	2.8	3.5	0.005	36
3	100 LB	-28	1425	81.1	82.6	83.2	81.5	0.87	0.85	0.78	0.66	6.0	8.3	7	20.1	2.9	3.1	0.007	39
4	112 M	-28	1445	84.4	85.3	85.1	83.0	0.86	0.82	0.76	0.64	7.9	7.6	7	26.4	3.1	3.5	0.010	45
5.5	132 S	-38	1450	86.0	87.0	87.1	85.9	0.87	0.85	0.81	0.71	10.4	6.8	11	36.2	2.3	3.1	0.021	72
7.5	132 M	-38	1450	87.0	88.1	88.4	87.4	0.88	0.87	0.83	0.74	13.7	7.5	9	49.4	2.6	2.9	0.030	84
11	160 M	-42	1460	88.4	89.2	89.3	87.9	0.86	0.85	0.83	0.75	20.0	6.9	12	72	2.0	2.8	0.075	130
15	160 L	-42	1465	89.3	90.2	90.1	88.8	0.87	0.86	0.83	0.76	27.2	7.2	10	98	2.3	2.9	0.092	145
18.5	180 M	-48	1470	90.2	90.7	90.6	89.2	0.90	0.89	0.86	0.77	32.0	7.0	17	120	2.1	3.0	0.139	180
22	180 L	-48	1470	91.2	91.8	91.9	90.8	0.91	0.89	0.85	0.76	37.4	7.7	14	143	2.2	3.5	0.158	200
30	200 L	-55	1475	91.2	91.4	91.1	89.5	0.92	0.87	0.84	0.76	52	7.5	20	194	2.2	3.1	0.262	260
37	225 S	-60	1485	93.3	93.6	93.4	92.2	0.91	0.89	0.89	0.84	61	7.2	20	238	1.8	2.9	0.406	310
45	225 M	-60	1485	93.5	93.7	93.4	92.2	0.91	0.90	0.88	0.82	74	7.6	7	289	1.9	2.9	0.469	340
55	250 M	-65	1480	93.9	94.1	93.9	92.7	0.91	0.90	0.89	0.83	90	8.2	10	355	2.4	3.1	0.66	405
75	280S	-75	1490	95.2	95.0	94.6	93.2	0.95	0.91	0.88	0.78	121	7.7	20	481	2.5	3.2	1.12	565
90	280 M	-75	1485	94.9	94.9	94.7	93.6	0.90	0.90	0.89	0.84	147	7.3	20	579	2.5	3.3	1.46	665
110	315 S	-80	1489	94.8	94.6	94.1	92.4	0.93	0.92	0.92	0.84	176	8.2	-	706	2.3	2.8	3.11	1000
132	315 MA	-80	1490	95.2	95.0	94.4	92.9	0.92	0.92	0.90	0.85	210	8.1	-	846	2.2	2.7	3.62	1100
160	315 LA	-80	1489	95.7	95.5	95.1	93.9	0.92	0.92	0.89	0.84	254	8.2	-	1026	2.3	2.9	4.13	1140
200	315 LB	-80	1487	95.8	95.5	95.3	94.2	0.92	0.91	0.88	0.80	322	7.5	-	1285	2.7	3.2	4.73	1190
220 <sup>9)</sup>	315 LC	-80	1485	95.8	95.6	95.3	94.4	0.92	0.91	0.89	0.83	352	6.9	-	1415	2.5	2.9	4.8	1230
250	355 MB	-95	1490	95.8	95.7	95.3	94.2	0.89	0.88	0.87	0.83	412	7.0	-	1602	2.1	3.0	6.5	1800
315	355LB	-95	1490	95.9	95.9	95.6	94.6	0.88	0.89	0.88	0.84	515	5.5	-	2019	1.5	2.9	8.2	1940
<b>High Output Design - CENELEC +1 frame allocations (SGA1)<sup>4)</sup></b>																			
5.5	112MB	-28	1435	84.7	86.3	86.3	84.7	0.88	0.84	0.82	0.66	10.5	6.6	-	36.6	2.3	2.4	0.0116	53
11 <sup>9)</sup>	132MB	-38	1440	88.0	89.2	89.8	89.3	0.86	0.83	0.78	0.68	20.6	7.8	-	73	1.9	3.0	0.034	81
75 <sup>9)</sup>	250MB	-65	1480	94.1	94.5	94.7	94.1	0.92	0.89	0.89	0.83	124	7.4	-	484	2.5	2.4	0.90	450
110	280MB	-75	1485	95.2	95.5	95.4	94.6	0.90	0.89	0.87	0.80	181	7.6	-	707	2.0	3.2	1.78	720
<b>Alternative frame allocations (SGAA)<sup>3)</sup></b>																			
55	250SM	-70	1480	93.9	94.1	93.9	92.7	0.91	0.90	0.89	0.83	90	8.2	10	355	2.4	3.1	0.66	405
75	250SM	-70	1480	94.1	94.5	94.7	94.1	0.92	0.89	0.89	0.83	124	7.4	-	484	2.5	2.4	0.90	450
90	280SM	-80	1485	94.9	94.9	94.7	93.6	0.90	0.90	0.89	0.84	147	7.3	20	579	2.5	3.3	1.46	662
110	280SM	-80	1485	95.2	95.5	95.4	94.6	0.90	0.89	0.87	0.80	181	7.6	-	707	2.0	3.2	1.78	720
132	315SM	-85	1490	95.2	95.0	94.4	92.9	0.92	0.92	0.90	0.85	210	8.1	-	846	2.2	2.7	3.62	1100
160	315SM	-85	1489	95.7	95.5	95.1	93.9	0.92	0.92	0.89	0.84	254	8.2	-	1026	2.3	2.9	4.13	1140
200	315ML	-90	1487	95.8	95.5	95.3	94.2	0.92	0.91	0.88	0.80	322	7.5	-	1285	2.7	3.2	4.73	1225
220	315ML	-90	1485	95.8	95.6	95.3	94.4	0.92	0.91	0.89	0.83	352	6.9	-	1415	2.5	2.9	4.80	1230
250	355ML	-100	1490	95.8	95.7	95.3	94.2	0.89	0.88	0.87	0.83	412	7.0	-	1602	2.1	3.0	6.5	1800
315	355ML	-100	1490	95.9	95.9	95.6	94.6	0.88	0.89	0.88	0.84	515	5.5	-	2019	1.5	2.9	8.2	1940

This data is provided for guidance only.

Results are guaranteed only when confirmed by test results.

<sup>1)</sup> F Class temperature rise

<sup>2)</sup> t<sub>E</sub> time applies to Ex e motors only and is explained in the hazardous

areas section.

<sup>3)</sup> The SGAA series are supplied as standard in South Africa.

<sup>4)</sup> The output of these motors is one step higher than the basic design with rated outputs in accordance with CENELEC.

# Full load currents at various power supplies

SGA series, three phase

Specifically wound for nominated power supply

kW	Motor frame	Current								Current		Speed 60Hz [ r/min ]
		Full load I <sub>N</sub> 50Hz								Full load I <sub>N</sub> 60Hz		
		380V [A]	400V [A]	415V [A]	525V [A]	690V [A]	1000V [A]	1100V [A]	380V [A]	440V [A]		
<b>1500\1800 r/min = 4 poles - CENELEC frame allocations</b>												
0.37	71B	-14	1.15	1.09	1.05	0.83	0.63	0.44	0.40	1.15	0.99	1650
0.55	80 A	-19	1.53	1.45	1.40	1.11	0.84	0.58	0.53	1.53	1.32	1668
0.75	80 B	-19	2.0	1.87	1.80	1.42	1.08	0.75	0.68	2.0	1.70	1686
1.1	90 S	-24	2.8	2.6	2.5	2.0	1.52	1.05	0.95	2.8	2.4	1692
1.5	90 L	-24	3.4	3.3	3.2	2.5	1.9	1.31	1.19	3.4	3.0	1686
2.2	100 LA	-28	4.9	4.7	4.5	3.6	2.7	1.9	1.70	4.9	4.2	1716
3	100 LB	-28	5.2	4.9	4.8	3.8	2.9	2.0	1.80	5.2	4.5	1710
4	112 M	-28	8.6	8.2	7.9	6.2	4.7	3.3	3.0	8.6	7.4	1734
5.5	132 S	-38	11.3	10.8	10.4	8.2	6.2	4.3	3.9	11.3	9.8	1740
7.5	132 M	-38	15.0	14.2	13.7	10.8	8.2	5.7	5.2	15.0	12.9	1740
11	160 M	-42	21.8	20.8	20.0	15.8	12.0	8.3	7.5	21.8	18.9	1752
15	160 L	-42	29.7	28.2	27.2	21.5	16.4	11.3	10.3	29.7	25.7	1758
18.5	180 M	-48	34.9	33.2	32.0	25.3	19.2	13.3	12.1	34.9	30.2	1764
22	180 L	-48	40.8	38.8	37.4	29.6	22.5	15.5	14.1	40.8	35.3	1764
30	200 L	-55	57	54	52	41.2	31.3	21.6	19.7	57	49.1	1770
37	225 S	-60	66	63	61	48.0	36.5	25.2	22.9	66	57	1782
45	225 M	-60	81	77	74	58	44.5	30.7	27.9	81	70	1782
55	250 M	-65	99	94	90	71	54	37.5	34.1	99	85	1776
75	280S	-75	132	125	121	96	73	50	45.6	132	114	1788
90	280 M	-75	160	152	147	116	88	61	55	160	138	1782
110	315 S	-80	192	182	176	139	106	73	66	192	166	1787
132	315 MA	-80	229	217	210	166	126	87	79	229	198	1788
160	315 LA	-80	278	264	254	201	153	106	96	278	240	1787
200	315 LB	-80	352	334	322	255	194	134	122	352	304	1784
220 <sup>0</sup>	315 LC	-80	384	365	352	278	212	146	133	384	332	1782
250	355 MB	-95	450	427	412	325	248	171	155	450	388	1788
315	355LB	-95	562	534	515	407	310	214	194	562	486	1788
<b>High Output Design - CENELEC +1 frame allocations (SGA1)<sup>4</sup></b>												
5.5	112MB	-28	11.5	10.9	10.5	8.3	6.3	4.4	4.0	11.5	9.9	1722
11 <sup>0</sup>	132MB	-38	22.5	21.3	20.6	16.3	12.4	8.5	7.8	22.5	19.4	1728
75 <sup>0</sup>	250MB	-65	135	128	124	98	74	51	46.7	135	117	1776
110	280MB	-75	198	188	181	143	109	75	68	198	171	1782
<b>Alternative frame allocations (SGAA)<sup>3</sup></b>												
55	250SM	-70	99	94	90	71	54	37.5	34.1	99	85	1776
75	250SM	-70	135	128	124	98	74	51	46.7	135	117	1776
90	280SM	-80	160	152	147	116	88	61	55	160	138	1782
110	280SM	-80	198	188	181	143	109	75	68	198	171	1782
132	315SM	-85	229	217	210	166	126	87	79	229	198	1788
160	315SM	-85	278	264	254	201	153	106	96	278	240	1787
200	315ML	-90	352	334	322	255	194	134	122	352	304	1784
220	315ML	-90	384	365	352	278	212	146	133	384	332	1782
250	355ML	-100	450	427	412	325	248	171	155	450	388	1788
315	355ML	-100	562	534	515	407	310	214	194	562	486	1788

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# Performance data

SGA series, three phase 415V 50Hz

IP55, F class insulation, B class temperature rise

kW	Motor frame	Speed [r/min]	Efficiency %				Power factor, cos φ				Current			Torque			Moment of inertia J=1/4GD <sup>2</sup> [ kg m <sup>2</sup> ]	Weight of foot mount motor [ kg ]	
			at % full load				at % full load				Full load I <sub>N</sub> [ A ]	Locked rotor I <sub>L</sub> /I <sub>N</sub>	t <sub>E</sub> time <sup>2)</sup> [ sec ]	Full load T <sub>N</sub> [ Nm ]	Locked rotor T <sub>L</sub> /T <sub>N</sub>	Break down T <sub>B</sub> /T <sub>N</sub>			
<b>1000 r/min = 6 poles - CENELEC frame allocations</b>																			
0.37	80 A	-19	915	64.3	67.5	67.6	63.4	0.77	0.70	0.60	0.48	1.08	3.4	55	3.9	1.8	4.5	0.002	18
0.55	80 B	-19	925	64.7	68.6	68.8	64.7	0.74	0.66	0.58	0.45	1.60	3.3	40	5.7	1.4	2.1	0.002	19
0.75	90 S	-24	935	72.8	74.4	74.1	70.7	0.78	0.72	0.63	0.50	1.93	4.6	30	7.7	2.4	2.6	0.003	24
1.1	90 L	-24	930	72.9	75.6	76.6	74.8	0.81	0.77	0.70	0.57	2.7	4.5	25	11.3	2.3	2.4	0.004	30
1.5	100 L	-28	950	76.1	77.7	77.6	74.9	0.79	0.73	0.66	0.53	3.7	5.1	8	15.1	2.2	3.0	0.007	35
2.2	112 M	-28	945	78.9	80.2	80.2	77.1	0.80	0.76	0.67	0.53	5.0	5.6	12	22.2	2.7	3.0	0.014	45
3	132 S	-38	970	83.5	84.6	84.5	82.0	0.82	0.77	0.70	0.57	6.4	6.7	12	29.5	2.3	3.2	0.029	70
4	132 MA	-38	965	83.6	84.5	84.2	82.6	0.81	0.77	0.68	0.58	8.5	6.7	9	39.6	2.5	3.2	0.036	80
5.5	132 MB	-38	965	84.4	85.6	85.9	84.3	0.84	0.81	0.76	0.64	11.0	6.9	9	54.4	2.4	3.0	0.045	90
7.5	160 M	-42	970	87.5	88.4	88.5	87.0	0.79	0.76	0.70	0.59	15.5	6.0	20	74	2.2	2.6	0.088	130
11	160 L	-42	970	88.1	89.3	89.9	89.2	0.80	0.79	0.74	0.65	23.6	5.8	16	108	2.2	2.4	0.116	160
15	180 L	-48	980	88.4	89.2	89.2	87.9	0.85	0.83	0.79	0.69	28.4	6.0	20	146	2.0	2.7	0.207	195
18.5	200 LA	-55	980	89.2	89.6	89.3	87.5	0.85	0.83	0.78	0.68	34.8	6.9	20	180	2.4	3.3	0.315	225
22	200 LB	-55	980	89.9	90.9	91.1	90.1	0.85	0.84	0.79	0.70	40.3	6.6	15	214	2.2	3.5	0.36	255
30	225 M	-60	985	92.3	92.7	92.6	91.4	0.87	0.86	0.84	0.77	52	7.2	25	291	2.1	3.0	0.547	297
37	250 M	-65	985	92.6	92.9	92.9	91.8	0.88	0.88	0.85	0.78	63	6.6	25	359	2.0	3.0	0.834	413
45	280 S	-75	985	93.1	93.3	93.3	92.1	0.88	0.88	0.87	0.80	77	6.9	25	436	2.0	3.1	1.39	536
55	280 M	-75	985	92.6	93.0	93.0	91.9	0.88	0.89	0.88	0.84	92	6.6	25	533	2.0	3.2	1.65	595
75	315 S	-80	990	94.3	94.2	93.7	92.0	0.88	0.88	0.85	0.79	126	7.1	-	724	2.1	2.9	4.11	990
90	315 MA	-80	990	94.8	94.7	94.2	94.9	0.89	0.88	0.84	0.75	151	7.8	-	868	2.5	2.8	4.78	1080
110	315 LA	-80	990	95.1	95.2	94.6	93.4	0.89	0.88	0.85	0.77	183	7.5	-	1061	2.9	3.1	5.45	1150
132	315 LB	-80	990	94.9	94.7	93.9	92.2	0.88	0.86	0.82	0.72	227	7.6	-	1273	2.4	3.1	6.12	1210
160 <sup>9)</sup>	355 MA	-95	990	94.9	95.0	94.8	93.5	0.90	0.89	0.87	0.81	262	8.3	-	1543	2.0	2.4	9.5	1590
200 <sup>9)</sup>	355 MC	-95	990	95.2	95.1	95.0	94.1	0.90	0.91	0.90	0.86	322	6.5	-	1929	1.5	2.0	10.4	1750
250 <sup>9)</sup>	355 LB	-95	990	95.0	95.0	95.0	94.0	0.88	0.88	0.87	0.84	416	6.4	-	2412	1.9	2.4	12.4	1990
<b>Alternative frame allocations (SGAA)<sup>3)</sup></b>																			
37	250SM	-70	985	92.6	92.9	92.9	91.8	0.88	0.88	0.85	0.78	63	6.6	25	359	2.0	3.0	0.834	413
45	250SM	-70	985	93.1	93.3	93.3	92.1	0.88	0.88	0.87	0.80	77	6.9	-	436	2.0	3.1	1.39	536
55	280SM	-80	985	92.6	93.0	93.0	91.9	0.88	0.89	0.88	0.84	92	6.6	25	533	2.0	3.2	1.65	595
75	280SM	-80	990	94.3	94.2	93.7	92.0	0.88	0.88	0.85	0.79	126	7.1	-	724	2.1	2.9	4.11	990
90	315SM	-85	990	94.8	94.7	94.2	94.9	0.89	0.88	0.84	0.75	151	7.8	-	867.7	2.5	2.8	4.78	1080
110	315ML	-85	990	95.1	95.2	94.6	93.4	0.89	0.88	0.85	0.77	183	7.5	-	1061	2.9	3.1	5.45	1150
132	315ML	-85	990	94.9	94.7	93.9	92.2	0.88	0.86	0.82	0.72	227	7.6	-	1273	2.4	3.1	6.12	1210
160 <sup>9)</sup>	355ML	-100	990	94.9	95.0	94.8	93.5	0.90	0.89	0.87	0.81	262	8.3	-	1543	2.0	2.4	9.5	1590
200 <sup>9)</sup>	355ML	-100	990	95.2	95.1	95.0	94.1	0.90	0.91	0.90	0.86	322	6.5	-	1929	1.5	2.0	10.4	1750
250 <sup>9)</sup>	355ML	-100	990	95.0	95.0	95.0	94.0	0.88	0.88	0.87	0.84	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.

<sup>1)</sup> F Class temperature rise

<sup>2)</sup> t<sub>E</sub> time applies to Ex e motors only and is explained in the hazardous areas section.

<sup>3)</sup> The SGAA series are supplied as standard in South Africa.

# Full load currents at various power supplies

SGA series, three phase

Specifically wound for nominated power supply

kW	Motor frame	Current								Current		Speed 60Hz [ r/min ]
		Full load I <sub>N</sub> 50Hz								Full load I <sub>N</sub> 60Hz		
		380V [A]	400V [A]	415V [A]	525V [A]	690V [A]	1000V [A]	1100V [A]	380V [A]	440V [A]		
<b>1000\1200 r/min = 6 poles - CENELEC frame allocations</b>												
0.37	80 A	-19	1.18	1.12	1.08	0.85	0.65	0.45	0.41	1.18	1.02	1098
0.55	80 B	-19	1.75	1.66	1.60	1.26	0.96	0.66	0.60	1.75	1.51	1110
0.75	90 S	-24	2.1	2.0	1.93	1.53	1.16	0.80	0.73	2.1	1.82	1122
1.1	90 L	-24	3.0	2.8	2.7	2.1	1.63	1.12	1.02	3.0	2.6	1116
1.5	100 L	-28	4.0	3.8	3.7	2.9	2.2	1.52	1.38	4.0	3.5	1140
2.2	112 M	-28	5.5	5.2	5.0	4.0	3.0	2.1	1.9	5.5	4.7	1134
3	132 S	-38	7.0	6.6	6.4	5.1	3.8	2.7	2.4	7.0	6.0	1164
4	132 MA	-38	9.3	8.8	8.5	6.7	5.1	3.5	3.2	9.3	8.0	1158
5.5	132 MB	-38	12.0	11.4	11.0	8.7	6.6	4.6	4.2	12.0	10.4	1158
7.5	160 M	-42	16.9	16.1	15.5	12.3	9.3	6.4	5.8	16.9	14.6	1164
11	160 L	-42	25.8	24.5	23.6	18.7	14.2	9.8	8.9	25.8	22.3	1164
15	180 L	-48	31.0	29.5	28.4	22.4	17.1	11.8	10.7	31.0	26.8	1176
18.5	200 LA	-55	38.0	36.1	34.8	27.5	20.9	14.4	13.1	38.0	32.8	1176
22	200 LB	-55	44.0	41.8	40.3	31.9	24.2	16.7	15.2	44.0	38.0	1176
30	225 M	-60	57	54	52	41.3	31.4	21.7	19.7	57	49.0	1182
37	250 M	-65	69	65	63	50	38.0	26.2	23.8	69	60	1182
45	280 S	-75	84	79	77	60	46.0	31.7	28.9	84	72	1182
55	280 M	-75	101	96	92	73	56	38.3	34.8	101	87	1182
75	315 S	-80	138	131	126	100	76	52	47.6	138	119	1188
90	315 MA	-80	165	157	151	119	91	63	57	165	142	1188
110	315 LA	-80	200	190	183	144	110	76	69	200	172	1188
132	315 LB	-80	248	235	227	179	136	94	86	248	214	1188
160 <sup>0</sup>	355 MA	-95	286	272	262	207	157	109	99	286	247	1188
200 <sup>0</sup>	355 MC	-95	352	334	322	255	194	134	122	352	304	1188
250 <sup>0</sup>	355 LB	-95	454	432	416	329	250	173	157	454	392	1188
<b>Alternative frame allocations (SGAA)<sup>3)</sup></b>												
37	250SM	-70	69	65	63	50	38.0	26.2	23.8	69	60	1182
45	250SM	-70	84	79	77	60	46.0	31.7	28.9	84	72	1182
55	280SM	-80	101	96	92	73	56	38.3	34.8	101	87	1182
75	280SM	-80	138	131	126	100	76	52	47.6	138	119	1188
90	315SM	-85	165	157	151	119	91	63	57	165	142	1188
110	315ML	-85	200	190	183	144	110	76	69	200	172	1188
132	315ML	-85	248	235	227	179	136	94	86	248	214	1188
160 <sup>0</sup>	355 MA	-100	286	272	262	207	157	109	99	286	247	1188
200 <sup>0</sup>	355 MC	-100	352	334	322	255	194	134	122	352	304	1188
250 <sup>0</sup>	355 LB	-100	454	432	416	329	250	173	157	454	392	1188

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



# Performance data

SGA series, three phase 415V 50Hz

IP55, F class insulation, B class temperature rise

kW	Motor frame	Speed [ r/min ]	Efficiency %				Power factor, cos $\phi$				Current			Torque			Moment of inertia J=1/4GD <sup>2</sup> [ kg m <sup>2</sup> ]	Weight of foot mount motor [ kg ]	
			at % full load				at % full load				Full load I <sub>N</sub> [ A ]	Locked rotor I <sub>L</sub> /I <sub>N</sub>	t <sub>E</sub> time <sup>2)</sup> [ sec ]	Full load T <sub>N</sub> [ Nm ]	Locked rotor T <sub>L</sub> /T <sub>N</sub>	Break down T <sub>B</sub> /T <sub>N</sub>			
<b>750 r/min = 8 poles - CENELEC frame allocations</b>																			
1.1	100 LB	-28	710	71.4	72.0	70.4	64.7	0.70	0.63	0.54	0.41	3.4	4.2	16	14.8	2.3	2.8	0.011	35
1.5	112 M	-28	705	75.6	77.6	77.8	75.0	0.73	0.67	0.59	0.46	4.0	4.4	25	20.3	2.1	2.6	0.025	43
2.2	132 S	-38	715	80.1	81.5	82.0	79.6	0.79	0.74	0.66	0.52	5.1	5.3	20	29.4	2.1	3.0	0.031	70
3	132 M	-38	715	81.4	83.0	83.3	81.5	0.79	0.74	0.67	0.54	6.7	5.6	20	40.0	2.3	3.0	0.040	85
4	160 MA	-42	720	84.4	85.6	85.7	84.1	0.78	0.74	0.66	0.54	8.9	6.1	30	53.0	2.4	3.3	0.075	115
5.5	160 MB	-42	715	84.9	86.5	87.2	86.3	0.80	0.77	0.71	0.59	11.6	5.7	25	73.5	2.1	2.9	0.093	127
7.5	160 L	-42	715	84.8	86.9	87.9	87.6	0.82	0.79	0.73	0.62	15.4	5.8	30	100	2.3	2.9	0.126	160
11	180 L	-48	730	86.6	87.6	87.7	86.2	0.80	0.76	0.70	0.57	22.7	6.0	14	144	1.8	2.3	0.203	175
15	200 L	-55	730	87.7	88.9	89.5	88.6	0.82	0.80	0.75	0.63	29.3	5.8	25	196	2.0	2.3	0.339	255
18.5	225 S	-60	735	91.5	91.7	91.2	89.3	0.79	0.76	0.72	0.62	37.1	5.2	40	240	1.8	2.2	0.491	271
22	225 M	-60	730	89.9	91.0	91.7	91.2	0.80	0.79	0.76	0.67	42.8	4.7	45	288	1.7	1.8	0.547	297
30	250 M	-65	735	90.6	91.6	91.7	90.7	0.80	0.79	0.74	0.63	58	5.6	35	390	2.1	2.4	0.834	410
37	280 S	-75	735	91.1	92.0	92.3	91.6	0.82	0.80	0.77	0.68	70	5.4	45	481	1.8	2.5	1.39	525
45	280 M	-75	740	92.0	92.4	92.4	91.2	0.80	0.78	0.74	0.63	86	6.0	40	581	2.1	3.2	1.65	595
55	315 S	-80	740	93.4	93.4	93.0	91.5	0.84	0.82	0.78	0.68	99	7.0	-	710	1.9	2.4	4.79	1000
75	315 MA	-80	740	94.3	94.2	93.7	92.2	0.83	0.82	0.77	0.67	135	7.8	-	968	2.2	2.4	5.58	1100
90	315 LA	-80	742	94.7	94.7	94.4	93.1	0.84	0.83	0.79	0.68	159	7.5	-	1158	2.1	2.5	6.37	1160
110	315 LB	-80	740	94.4	94.7	94.7	93.9	0.86	0.85	0.82	0.75	190	6.4	-	1420	1.7	2.3	7.23	1230
132	355 MA	-95	742	94.7	95.0	94.5	93.4	0.86	0.86	0.84	0.77	225	6.3	-	1699	1.5	2.5	7.9	1660
160	355 MB	-95	742	95.3	95.4	95.4	94.6	0.86	0.87	0.85	0.81	269	6.2	-	2059	1.3	2.5	10.3	1740
200 <sup>9)</sup>	355 LB	-95	742	95.0	95.0	95.2	94.0	0.87	0.82	0.80	0.80	356	5.7	-	2574	1.3	2.5	12.3	1980

## Alternative frame allocations (SGAA)<sup>3)</sup>

30	250SM	-70	735	90.6	91.6	91.7	90.7	0.80	0.79	0.74	0.63	58	5.6	35	390	2.1	2.4	0.834	410
37	250SM	-70	735	91.1	92.0	92.3	91.6	0.82	0.80	0.77	0.68	70	5.4	-	481	1.8	2.5	1.39	525
45	280SM	-80	740	92.0	92.4	92.4	91.2	0.80	0.78	0.74	0.63	86	6.0	40	581	2.1	3.2	1.65	595
55	280SM	-80	740	93.4	93.4	93.0	91.5	0.84	0.82	0.78	0.68	99	7.0	-	710	1.9	2.4	4.79	1000
75	315SM	-85	740	94.3	94.2	93.7	92.2	0.83	0.82	0.77	0.67	135	7.8	-	968	2.2	2.4	5.58	1100
90	315ML	-85	742	94.7	94.7	94.4	93.1	0.84	0.83	0.79	0.68	159	7.5	-	1158	2.1	2.5	6.37	1160
110	315ML	-85	740	94.4	94.7	94.7	93.9	0.86	0.85	0.82	0.75	190	6.4	-	1420	1.7	2.3	7.23	1230
132	355ML	-100	742	94.7	95.0	94.5	93.4	0.86	0.86	0.84	0.77	225	6.3	-	1699	1.5	2.5	7.9	1660
160	355ML	-100	742	95.3	95.4	95.4	94.6	0.86	0.87	0.85	0.81	269	6.2	-	2059	1.3	2.5	10.3	1740
200 <sup>9)</sup>	355ML	-100	742	95.0	95.0	95.2	94.0	0.87	0.82	0.80	0.80	356	5.7	-	2574	1.3	2.5	12.3	1980

This data is provided for guidance only.

Results are guaranteed only when confirmed by test results.

<sup>1)</sup> F Class temperature rise

<sup>2)</sup> t<sub>E</sub> time applies to Ex e motors only and is explained in the hazardous areas section.

<sup>3)</sup> The SGAA series are supplied as standard in South Africa.

# Full load currents at various power supplies

SGA series, three phase

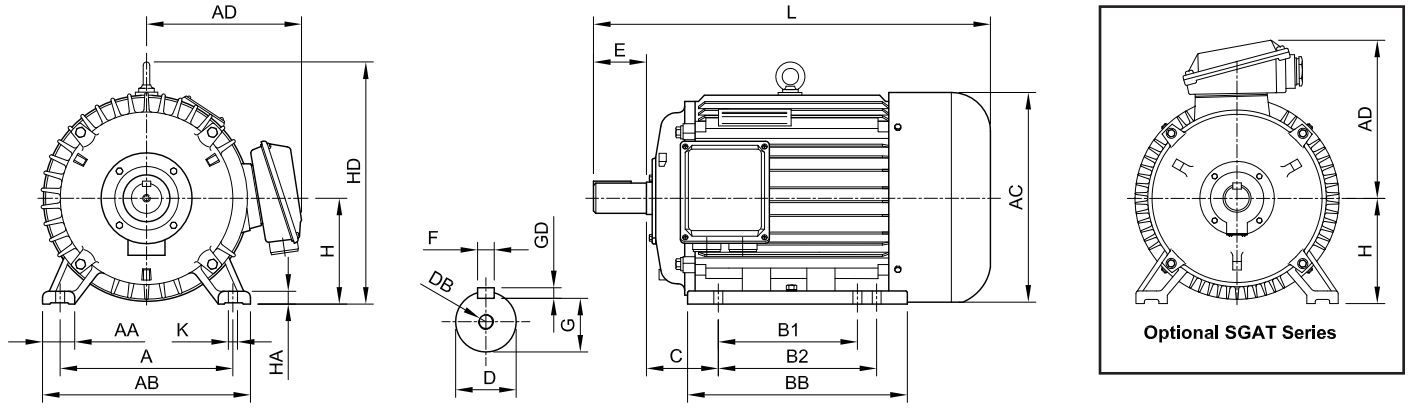
Specifically wound for nominated power supply

kW	Motor frame	Current									Current		Speed 60Hz [ r/min ]
		Full load I <sub>N</sub> 50Hz									Full load I <sub>N</sub> 60Hz		
		380V [ A ]	400V [ A ]	415V [ A ]	525V [ A ]	690V [ A ]	1000V [ A ]	1100V [ A ]	380V [ A ]	440V [ A ]			
<b>750\900 r/min = 8 poles - CENELEC frame allocations</b>													
1.1	100 LB	-28	3.7	3.5	3.4	2.7	2.0	1.40	1.27	3.7	3.2	852	
1.5	112 M	-28	4.3	4.1	4.0	3.1	2.4	1.64	1.49	4.3	3.7	846	
2.2	132 S	-38	5.6	5.3	5.1	4.0	3.1	2.1	1.92	5.6	4.8	858	
3	132 M	-38	7.3	7.0	6.7	5.3	4.0	2.8	2.5	7.3	6.3	858	
4	160 MA	-42	9.7	9.2	8.9	7.0	5.4	3.7	3.4	9.7	8.4	864	
5.5	160 MB	-42	12.7	12.0	11.6	9.2	7.0	4.8	4.4	12.7	10.9	858	
7.5	160 L	-42	16.8	16.0	15.4	12.2	9.3	6.4	5.8	16.8	14.5	858	
11	180 L	-48	24.8	23.6	22.7	17.9	13.7	9.4	8.6	24.8	21.4	876	
15	200 L	-55	32.0	30.4	29.3	23.2	17.6	12.2	11.1	32.0	27.6	876	
18.5	225 S	-60	40.5	38.5	37.1	29.3	22.3	15.4	14.0	40.5	35.0	882	
22	225 M	-60	46.7	44.4	42.8	33.8	25.7	17.8	16.1	46.7	40.4	876	
30	250 M	-65	63	60	58	45.7	34.8	24.0	21.8	63	55	882	
37	280 S	-75	76	72	70	55	41.9	28.9	26.3	76	66	882	
45	280 M	-75	94	90	86	68	52	35.9	32.6	94	81	888	
55	315 S	-80	108	103	99	78	60	41.1	37.4	108	93	888	
75	315 MA	-80	148	140	135	107	81	56	51	148	128	888	
90	315 LA	-80	173	165	159	126	96	66	60	173	150	890	
110	315 LB	-80	207	197	190	150	114	79	72	207	179	888	
132	355 MA	-95	246	234	225	178	135	93	85	246	212	890	
160	355 MB	-95	293	279	269	212	162	111	101	293	253	890	
200 <sup>0</sup>	355 LB	-95	388	369	356	281	214	148	134	388	335	890	
<b>Alternative frame allocations (SGAA)<sup>3)</sup></b>													
30	250SM	-70	63	60	58	45.7	34.8	24.0	21.8	63	55	882	
37	250SM	-70	76	72	70	55	41.9	28.9	26.3	76	66	882	
45	280SM	-80	94	90	86	68	52	35.9	32.6	94	81	888	
55	280SM	-80	108	103	99	78	60	41.1	37.4	108	93	888	
75	315SM	-85	148	140	135	107	81	56	51	148	128	888	
90	315ML	-85	173	165	159	126	96	66	60	173	150	890	
110	315ML	-85	207	197	190	150	114	79	72	207	179	888	
132	355ML	-100	246	234	225	178	135	93	85	246	212	890	
160	355ML	-100	293	279	269	212	162	111	101	293	253	890	
200 <sup>0</sup>	355ML	-100	388	369	356	281	214	148	134	388	335	890	

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

# Dimensional drawings

## Foot mount B3 (IM1001)



Motor frame	A	AA	AB	AC	AD	B1	B2	BB	C	D	DB	E	F	G	GD	H	HA	HD	K	L
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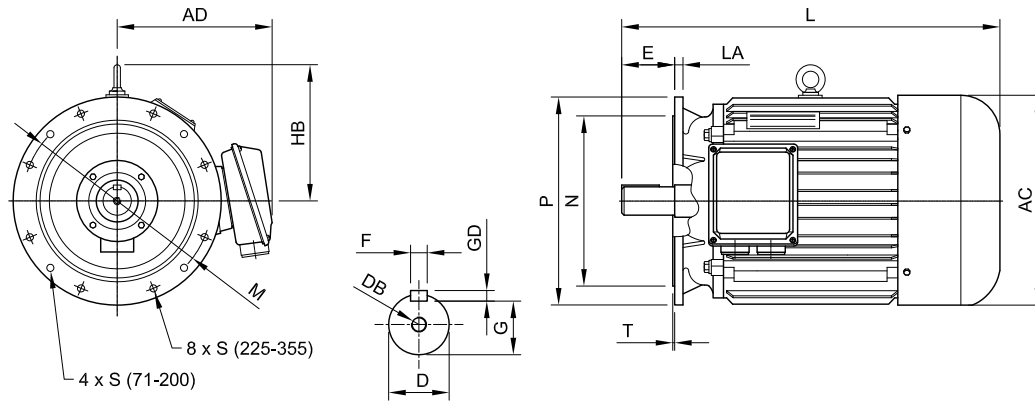
### CENELEC and CENELEC +1 frame allocations

71 <sup>2)</sup>	- 14	112	32	144	138	136 <sup>2)</sup>	-	90	120	45	14	M5	30	5	11.0	5	71	8	197 <sup>1) 2)</sup>	7	249
80	- 19	125	40	165	165	155	-	100	130	50	19	M6	40	6	15.5	6	80	10	170 <sup>1)</sup>	10	285
90S	- 24	140	40	180	175	160	-	100	130	56	24	M8	50	8	20.0	7	90	12	190 <sup>1)</sup>	10	310
90L	- 24	140	40	180	175	160	-	125	155	56	24	M8	50	8	20.0	7	90	12	190 <sup>1)</sup>	10	335
100L	- 28	160	40	205	205	180	-	140	176	63	28	M10	60	8	24.0	7	100	14	245	12	380
112M	- 28	190	50	245	230	185	-	140	180	70	28	M10	60	8	24.0	7	112	15	265	12	400
132S	- 38	216	60	280	275	205	-	140	200	89	38	M12	80	10	33.0	8	132	18	315	12	475
132M	- 38	216	60	280	275	205	-	178	238	89	38	M12	80	10	33.0	8	132	18	315	12	515
160M	- 42	254	70	320	325	255	-	210	270	108	42	M16	110	12	37.0	8	160	20	375	15	600
160L	- 42	254	70	320	325	255	-	254	314	108	42	M16	110	12	37.0	8	160	20	375	15	645
180M	- 48	279	70	356	360	270	-	241	311	121	48	M16	110	14	42.5	9	180	22	410	15	670
180L	- 48	279	70	356	360	270	-	279	349	121	48	M16	110	14	42.5	9	180	22	410	15	710
200L	- 55	318	75	395	400	310	-	305	375	133	55	M20	110	16	49.0	10	200	25	460	19	775
225S	- 60	356	75	435	450	335	-	286	368	149	60	M20	140	18	53.0	11	225	28	520	19	820
225M*	- 55	356	75	435	450	335	-	311	393	149	55	M20	110	16	49.0	10	225	28	520	19	815
225M	- 60	356	75	435	450	335	-	311	393	149	60	M20	140	18	53.0	11	225	28	520	19	845
250M*	- 60	406	80	490	495	385	-	349	455	168	60	M20	140	18	53.0	11	250	30	575	24	930
250M	- 65	406	80	490	495	385	-	349	455	168	65	M20	140	18	58.0	11	250	30	575	24	930
280S*	- 65	457	85	550	555	410	-	368	530	190	65	M20	140	18	58.0	11	280	35	640	24	1000
280S	- 75	457	85	550	555	410	-	368	530	190	75	M20	140	20	67.5	12	280	35	640	24	1000
280M*	- 65	457	85	550	555	410	-	419	581	190	65	M20	140	18	58.0	11	280	35	640	24	1050
280M	- 75	457	85	550	555	410	-	419	581	190	75	M20	140	20	67.5	12	280	35	640	24	1050
315S*	- 65	508	125	635	640	530	-	406	620	216	65	M20	140	18	58.0	11	315	50	770	28	1170
315S	- 80	508	125	635	640	530	-	406	620	216	80	M20	170	22	71.0	14	315	50	770	28	1200
315M*	- 65	508	125	635	640	530	-	457	670	216	65	M20	140	18	58.0	11	315	50	770	28	1220
315M	- 80	508	125	635	640	530	-	457	670	216	80	M20	170	22	71.0	14	315	50	770	28	1250
315L*	- 65	508	125	635	640	530	-	508	720	216	65	M20	140	18	58.0	11	315	50	770	28	1320
315L	- 80	508	125	635	640	530	-	508	720	216	80	M20	170	22	71.0	14	315	50	770	28	1350
355M*	- 75	610	135	730	715	608	-	560	810	254	75	M20	140	20	67.5	12	355	52	847	28	1525
355M	- 95	610	135	730	715	608	-	560	810	254	95	M24	170	25	86.0	14	355	52	847	28	1555
355L*	- 75	610	135	730	715	608	-	630	810	254	75	M20	140	20	67.5	12	355	52	847	28	1525
355L	- 95	610	135	730	715	608	-	630	810	254	95	M24	170	25	86.0	14	355	52	847	28	1555

### Alternative frame allocations (SGAA)<sup>3)</sup>

250SM*	- 60	406	80	490	495	385	311	349	455	168	60	M20	140	18	53.0	11	250	30	575	24	930
250SM	- 70	406	80	490	495	385	311	349	455	168	70	M20	140	20	62.5	12	250	30	575	24	930
280SM*	- 65	457	85	550	555	410	368	419	581	190	65	M20	140	18	58.0	11	280	35	640	24	1050
280SM	- 80	457	85	550	555	410	368	419	581	190	80	M20	140	22	71.0	14	280	35	640	24	1050
315SM*	- 65	508	125	635	640	530	406	457	670	216	65	M20	140	18	58.0	11	315	50	770	28	1220
315SM	- 85	508	125	635	640	530	406	457	670	216	85	M20	170	22	76.0	14	315	50	770	28	1250
315ML*	- 65	508	125	635	640	530	457	508	720	216	65	M20	140	18	58.0	11	315	50	770	28	1320
315ML*	- 70	508	125	635	640	530	457	508	720	216	70	M20	140	20	62.5	12	315	50	770	28	1320
315ML	- 85	508	125	635	640	530	457	508	720	216	85	M20	170	22	76.0	14	315	50	770	28	1350
315ML	- 90	508	125	635	640	530	457	508	720	216	90	M24	170	25	81.0	14	315	50	770	28	1350
355ML	- 100	610	135	730	715	608	560	630	810	254	95	M24	170	25	86.0	14	355	52	847	28	1555

# Large flange mount B5 (IM3001)

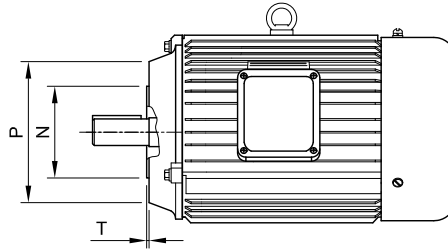
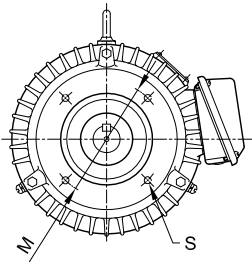


Motor frame	AC	AD	D	DB	E	F	G	GD	HB	L	LA	M	N	P	S	T	
<b>CENELEC and CENELEC +1 frame allocations</b>																	
71 <sup>2)</sup>	- 14	138	136 <sup>2)</sup>	14	M5	30	5	11.0	5	126 <sup>1) 2)</sup>	249	12	130	110	160	10	3.5
80	- 19	165	155	19	M6	40	6	15.5	6	90 <sup>1)</sup>	285	12	165	130	200	12	3.5
90S	- 24	175	160	24	M8	50	8	20.0	7	100 <sup>1)</sup>	310	12	165	130	200	12	3.5
90L	- 24	175	160	24	M8	50	8	20.0	7	100 <sup>1)</sup>	335	12	165	130	200	12	3.5
100L	- 28	205	180	28	M10	60	8	24.0	7	145	380	14	215	180	250	15	4.0
112M	- 28	230	185	28	M10	60	8	24.0	7	153	400	14	215	180	250	15	4.0
132S	- 38	275	205	38	M12	80	10	33.0	8	183	475	14	265	230	300	15	4.0
132M	- 38	275	205	38	M12	80	10	33.0	8	183	515	14	265	230	300	15	4.0
160M	- 42	325	255	42	M16	110	12	37.0	8	215	600	16	300	250	350	19	5.0
160L	- 42	325	255	42	M16	110	12	37.0	8	215	645	16	300	250	350	19	5.0
180M	- 48	360	270	48	M16	110	14	42.5	9	230	670	18	300	250	350	19	5.0
180L	- 48	360	270	48	M16	110	14	42.5	9	230	710	18	300	250	350	19	5.0
200L	- 55	400	310	55	M20	110	16	49.0	10	260	775	18	350	300	400	19	5.0
225S	- 60	450	335	60	M20	140	18	53.0	11	295	820	20	400	350	450	19	5.0
225M*	- 55	450	335	55	M20	110	16	49.0	10	295	815	20	400	350	450	19	5.0
225M	- 60	450	335	60	M20	140	18	53.0	11	295	845	20	400	350	450	19	5.0
250M*	- 60	495	385	60	M20	140	18	53.0	11	325	930	22	500	450	550	19	5.0
250M	- 65	495	385	65	M20	140	18	58.0	11	325	930	22	500	450	550	19	5.0
280S*	- 65	555	410	65	M20	140	18	58.0	11	360	1000	22	500	450	550	19	5.0
280S	- 75	555	410	75	M20	140	20	67.5	12	360	1000	22	500	450	550	19	5.0
280M*	- 65	555	410	65	M20	140	18	58.0	11	360	1050	22	500	450	550	19	5.0
280M	- 75	555	410	75	M20	140	20	67.5	12	360	1050	22	500	450	550	19	5.0
315S*	- 65	640	530	65	M20	140	18	58.0	11	455	1170	25	600	550	660	24	6.0
315S	- 80	640	530	80	M20	170	22	71.0	14	455	1200	25	600	550	660	24	6.0
315M*	- 65	640	530	65	M20	140	18	58.0	11	455	1220	25	600	550	660	24	6.0
315M	- 80	640	530	80	M20	170	22	71.0	14	455	1250	25	600	550	660	24	6.0
315L*	- 65	640	530	65	M20	140	18	58.0	11	455	1320	25	600	550	660	24	6.0
315L	- 80	640	530	80	M20	170	22	71.0	14	455	1350	25	600	550	660	24	6.0
355M*	- 75	715	608	75	M20	140	20	67.5	12	492	1525	32	740	680	800	24	6.0
355M	- 95	715	608	95	M24	170	25	86.0	14	492	1555	32	740	680	800	24	6.0
355L*	- 75	715	608	75	M20	140	20	67.5	12	492	1525	32	740	680	800	24	6.0
355L	- 95	715	608	95	M24	170	25	86.0	14	492	1555	32	740	680	800	24	6.0

## Alternative frame allocations (SGAA)<sup>3)</sup>

250SM*	- 60	495	385	60	M20	140	18	53.0	11	325	930	22	500	450	550	19	5.0
250SM	- 70	495	385	70	M20	140	20	62.5	12	325	930	22	500	450	550	19	5.0
280SM*	- 65	555	410	65	M20	140	18	58.0	11	360	1050	22	500	450	550	19	5.0
280SM	- 80	555	410	80	M20	140	22	71.0	14	360	1050	22	500	450	550	19	5.0
315SM*	- 65	640	530	65	M20	140	18	58.0	11	455	1220	25	600	550	660	24	6.0
315SM	- 85	640	530	85	M20	170	22	76.0	14	455	1250	25	600	550	660	24	6.0
315ML*	- 65	640	530	65	M20	140	18	58.0	11	455	1320	25	600	550	660	24	6.0
315ML*	- 70	640	530	70	M20	140	20	62.5	12	455	1320	25	600	550	660	24	6.0
315ML	- 85	640	530	85	M20	170	22	76.0	14	455	1350	25	600	550	660	24	6.0
315ML	- 90	640	530	90	M24	170	25	81.0	14	455	1350	25	600	550	660	24	6.0
355ML	- 100	715	608	95	M24	170	25	86.0	14	492	1555	32	740	680	800	24	6.0

## Small flange (face) mount B14 (IM3601)



### B14A

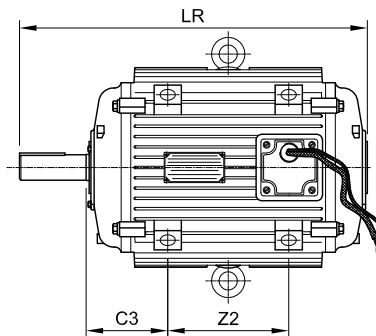
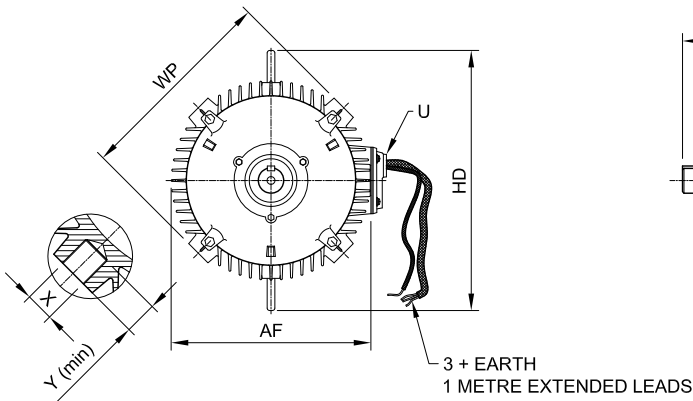
Motor frame	M	N	P	S	T
71	85	70	105	M6	2.5
80	100	80	120	M6	3.0
90	115	95	140	M8	3.0
100	130	110	160	M8	3.5
112	130	110	160	M8	3.5
132	165	130	200	M10	3.5
160	215	180	250	M12	4.0

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

### 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

## PAD mount airstream rated motors with extended leads - SGAPRF



Motor frame	AF	C3	HD	LR	U	WP	X	Y	Z2	Preferred 2 pole ratings*	
100L	-28	210	83	290	325	M25x1.5	220	M12x1.75	21	100	3kW SGA 4kW SGA1
132S	-38	264	108	354	400	M25x1.5	290	M16x2.0	29	125	5.5kW SGA 7.5kW SGA
160M	-42	330	135	430	540	M32x1.5	340	M20x2.5	27	155	11kW SGA 15kW SGA
160L	-42	330	135	430	580	M32x1.5	340	M20x2.5	27	200	18.5kW SGA 22kW SGA1
200L	-55	410	174	510	680	M50x1.5	431	M24x3.0	34	224	37kW SGA 45kW SGA1

\*For performance data see pages 16 & 17.  
Other speeds and power ratings available on request.



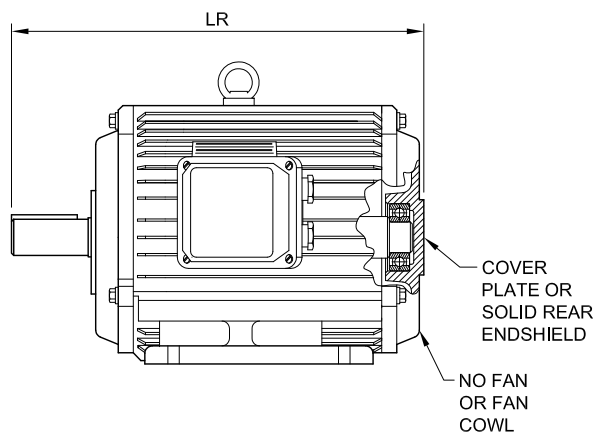
# Airstream rated motors for axial fans

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 these motors have a higher efficiency than standard SGA motors.

## Standard mount - SGAR (B3, B5, B3/B5)



Motor frame	Dimension [ LR ]	Motor frame	Dimension [ LR ]	Motor frame	Dimension [ LR ]
71	210	160L	580	280M	945
80	240	180M	595	315S*	980
90S	265	180L	630	315S	1010
90L	290	200L	680	315M*	1070
100L	325	225S	725	315M	1100
112M	340	225M*	720	315L*	1140
132S	400	225M	750	315L	1170
132M	435	250M	820		
160M	540	280S	890		

\*2 pole motors only

SGARF is a popular alternative to SGAR, with the terminal box replaced by blanking plate and extended leads (see page 33 for details on blanking plates and extended leads). In this case, terminal box and block are supplied loose with motor for convenience of remote leads termination. These motors are also available in H class insulation (SGARHF).

## Pad mount - SGAPR

SGAPR are SGAR style motors with standard mount replaced with pad mount.

SGAPRF is a popular alternative to SGAPR, with the terminal box replaced by blanking plate and extended leads (see page 26 for further details).

# Cooling tower - SGAC

SGAC (formerly SGACT) cooling tower motors are specially developed for operation in air stream rated cooling towers. SGAC motors are available in frame sizes 71 to 355, and rated power outputs of 0.37 to 315kW.

## Applications

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

## Protection

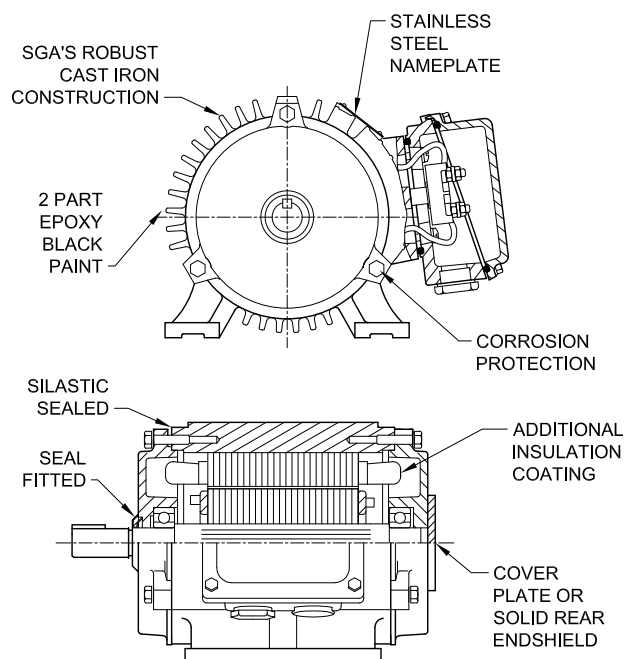
CMG SGAC motors have a protection rating of IP66 for maximum protection against water and dust.

## 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
- Non-drive end shaft extension cut and blanking plate fitted. Alternatively, SGAR used as base motor.

## Paint

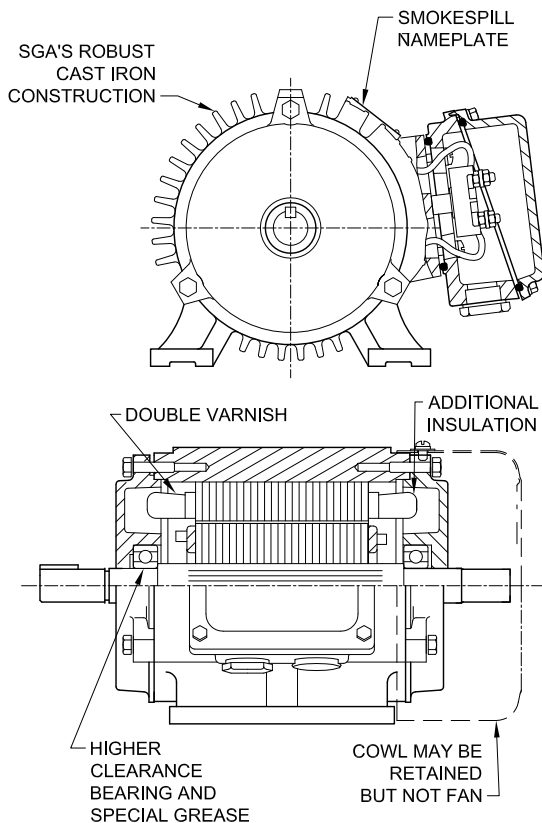
Standard paint finish for SGAC motors is a 2 part epoxy RAL 9005 Jet Black paint. CMG's SGAC range of cooling tower motors combine the SGA's standard high strength and high efficiency with significant enhancements to give the perfect motor for cooling tower applications.



# Smokespill - SGAS/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.

The standard SGAS range (formerly SGASS), wound with F class insulation in frame sizes 80A to 180L, meet the rating-1 requirements. SGAHS range, wound with H class insulation in frame sizes 80A to 315L, meet either rating-1 or rating-2 requirements. SGAHS range is also suitable for applications at 300°C for 2 hours.



## Smokespill features

The standard SGA motor is inherently suitable for upgrading to the smokespill application due to its low temperature rise. When SGAS motors are ordered F class motors are modified and when SGAHS motors are ordered 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 crown
- 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 AS4429 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 SGAS and SGAHS motors.

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

The SGAS 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

SGAS motors can be supplied either with terminal boxes or with extended leads through a gland plate (see page 33 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 SGAS range is RAL 7012 Basalt Grey, and RAL 3000 Flame Red for the SGAHS range. Other colors are available on request.

## Nameplates

CMG Smokespill motors are marked with special nameplates labelling 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.

# 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.

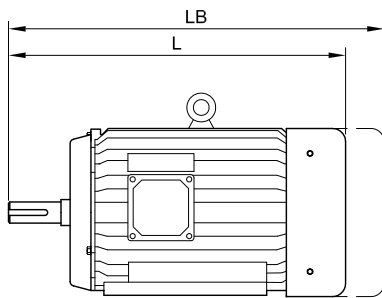
SGAB brake motors are “fail to safe” design, as the brake will engage when power is interrupted.

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.

## 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 LB.



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

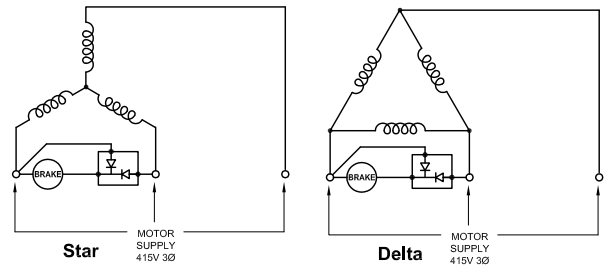
## Brake details

Output kW	Motor frame	Brake model	Brake weight [ kg ]	Motor full load torque $T_N$ [ Nm ]	Brake torque [ Nm ]			Brake torque [ % of full load ]		
					Nominal	Min	Max	Nominal	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	7.4	26.7	60	20	75	220%	70%	280%
5.5	132S-4	M60	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	19.0	72	150	50	185	210%	70%	260%
15	160L-4	M150	19.0	98	150	50	185	150%	50%	190%
18.5	180M-4	M250	33.0	120	250	90	310	210%	80%	260%
22	180L-4	M250	33.0	142	250	90	310	180%	60%	220%

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

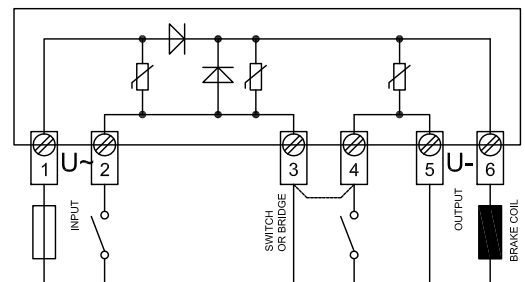
## Connection

SGAB motors 3kW and below are connected in 415V star connection with brake connected as shown below left. SGAB motors 4kW and above are connected in 415 volt delta connection with brake connected as shown below right.



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 as shown below.



# 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 nA (formerly Ex n) and Ex tD (formerly DIP), supplied with protection ratings IP55, IP65 or IP66. SGA Hazardous area motors are available in motor frame sizes 71 to 280, with 315 frame certificate pending (Ex nA and Ex tD only). Combinations of protection such as Ex e and Ex tD or Ex nA and Ex tD are also available.

## International and Australian standards

IEC or AS/NZS 61241.1 and AS 2381.1 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 gases, 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 AS/NZS3000).

## European Standards



European standards 'EN' series are closely aligned with IEC standards. They share the same numbering and require assessment and certification to ATEX directives, issued by the European Union.

The ATEX directive (94/9/EC, 23.03.94) addresses both the compliance of hazardous area equipment to specified standards, and the compliance to EH&SR (Essential Health & Safety Requirements).

## Paint

Standard color finish for the hazardous area range is RAL 7012 Basalt Grey, with primary option of RAL 1004 Golden Yellow for SGAE. Other colors are available on request.

## Motor protection types

### SGAE - Ex e

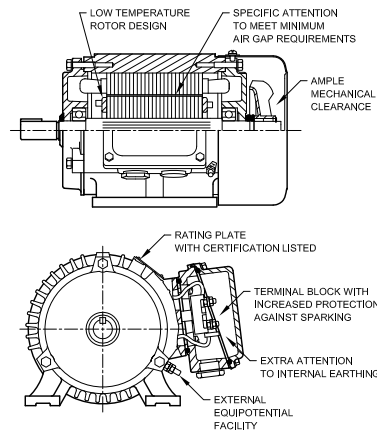
Ex e motor protection designates Increased safety as outlined in IEC, EN or AS/NZS 60079-7.

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 II (A,B&C) hazardous areas, and CMG provides for a temperature class of T3 (200°C) in a 40°C ambient (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 nA (formerly Ex n)

Ex nA motor protection designates Non-sparking as outlined in IEC, EN or AS/NZS 60079-15. Non-sparking (Ex nA) 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 nA) motors are suitable for Class I, Zone 2, Group II (A,B&C) hazardous areas, and CMG provides for a temperature class of T3 (200°C) in a 50°C ambient.

## SGAD - Ex tD (formerly DIP)

Ex tD motor protection designates dust-excluding ignition proofing as outlined in IEC or AS/NZS61241 series of standards.

Dust-excluding ignition proofing (Ex tD) 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 (Ex tD) motors are suitable for Zone 21 and 22 dust laden hazardous areas, and CMG provides for a temperature class of T4 (135°C) in a 50°C ambient.

## Hazardous area classifications

Hazardous areas fall into two categories; hazards due to flammable gases (vapors or mists), and hazards due to combustible dusts (fibres or particles).

### Gaseous hazards

Explosive gas atmospheres are classified into zones based on the frequency and duration of their occurrence as below:

Zone 0: an area in which an explosive gas atmosphere is present continuously, for long periods, or is present frequently.

Zone 1: an area in which an explosive gas atmosphere is likely to occur in normal operation occasionally.

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.

Electrical apparatus for potentially explosive atmospheres is divided into the following groups:

Group I: mines susceptible to fire damp (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

Electrical apparatus of Group II may be subdivided according to the nature of the potentially explosive atmosphere for which it is intended.

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



## Combustible dust hazards

Many dusts which are generated, processed, handled and stored, are combustible. When ignited, they can burn rapidly and with considerable explosive force if mixed with air in the appropriate proportions. Electrical apparatus used in locations where this hazard is present, requires adequate protection so as to reduce the likelihood of ignition of the external explosive atmosphere.

Areas where dusts, flyings and fibres in air occur in dangerous quantities are classified as hazardous and are divided into three zones according to the level of risk.

**Zone 20:** An area in which combustible dust, as a cloud, is present continuously or frequently during normal operation, in sufficient quantity to be capable of producing an explosive dust/air mixture, and/or where layers of dust of uncontrollable and excessive thickness can be formed.

**Zone 21:** An area not classified as Zone 20 in which combustible dust, as a cloud, is likely to occur during normal operation, in sufficient quantities to be capable of producing an explosive dust/air mixture.

**Zone 22:** An area not classified as Zone 21 in which combustible dust clouds may occur infrequently, and persist for only a short period, or in which accumulations or layers of combustible dust may be present under abnormal conditions and give rise to combustible dust/air mixtures. Where, following an abnormal condition, the removal of dust accumulations or layers cannot be assured then the area is to be classified.

Ignition protection is based on the limitation of the maximum surface temperature of the enclosure and on other surfaces which could be in contact with dust and on the restriction of dust ingress into the enclosure by the use of dust tight or dust protected enclosures.

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

Specifications and characteristics of some common combustible dusts are listed in the table below:

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

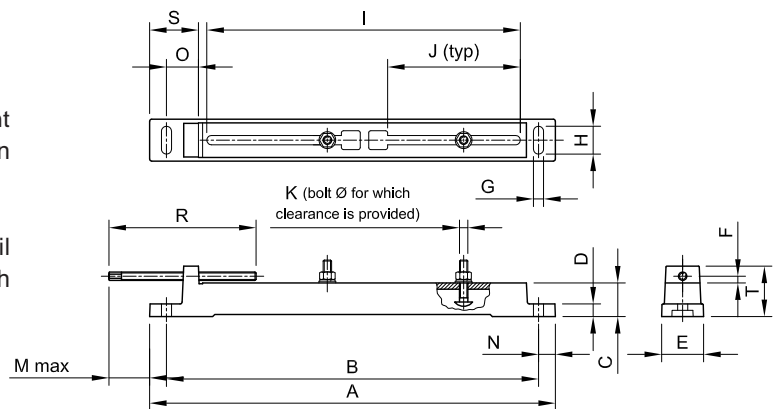
## Slide rails

Slide rails are designed for motor position adjustment when belt drives are used. 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.

Slide rail dimensions

Slide rail product code	To suit motor frame	Dimensions [ mm ]																	Weight per set [ kg ]
		A	B	C	D	E	F	G	H	I	J	K	M	N	O	R	S	T	
MR080090	80 & 90	380	328	30	15	48	10	15	25	245	95	8	75	25	40	145	65	50	3
MR100132	100, 112 & 132	475	425	37	19	70	10	14	35	340	150	10	135	26	42	200	68	62	6.5
MR160180	160 & 180	567	515	48	19	72	11	18	35	390	162	12	115	28	57	200	85	70	10
MR200225	200 & 225	790	730	60	32	92	16	20	20	610	265	16	200	30	60	290	90	92	22
MR250280	250 & 280	945	870	70	38	105	16	21	21	725	305	20	240	35	70	350	105	110	40
MR315355	315 & 355	1220	1115	125	40	122	22	30	30	920	420	24	285	50	105	450	155	170	105



# Modifications, variations and optional extras

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

Multi-speed

Brake motors - **SGAB**

Smokespill applications - **SGAS** and **SGAHS**

Airstream motors for axial fans - **SGAR**, **SGARF** and **SGARHF**

PAD mount airstream motors for axial fans - **SGAPR** and **SGAPRF**

Cooling tower motors - **SGAC**

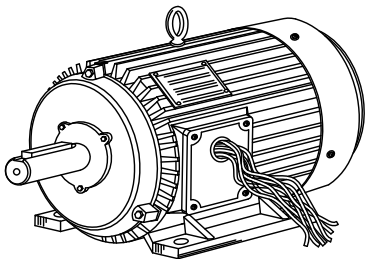
Hazardous area motors - **SGAE**, **SGAN** and **SGAD**

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) - **SGAF**



Extended leads: 1.5m  
No. of power leads: 3+1 for up to 3kW,  
6+1 for 4kW and above

Motor frame	Conduit size
71-132	M25 x 1.5
160-180	M32 x 1.5
200-250	M50 x 1.5
280-315	M63 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 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 fans
- Tropic proofing
- Special paint finish
- 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.

## VVVF drives

Two types of VVVF drives kit are available for the SGA range to assist in maintaining satisfactory operation.

### VVVF drive kit A - Separately driven cooling fan (240 & 415V)

This fan should be used when the motor speed is required to be reduced below 25Hz in constant torque mode. For centrifugal fan or pump, no separate cooling fan is required. For all other loads refer to the loadability curve in the section on VVVF Drives, refer page 14.

### VVVF drive kit B - Standard motor (EDM)

This kit incorporates a single insulated bearing, normally at the non-drive end, designed to remove the effect of electrical discharge through the bearings.

## 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 and ILAC accredited test laboratory.



Accreditation No. 14396

Type test reports and outline drawings of standard motors are available at [www.cmgroup.com.au](http://www.cmgroup.com.au).

# 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.

High speed	Low speed	Frame	High speed		Low speed	
[ kW ]	[ kW ]		[ r/min ]	[ A ]	[ r/min ]	[ A ]

## 3000/1500 r/min = 2/4 Poles

### Fan duty – single winding 人 / 人 (MAE)

0.8	0.16	80B-4	2730	1.9	1375	0.40
1.2	0.24	90S-4	2825	2.6	1425	0.57
1.7	0.34	90L-4	2870	3.5	1430	0.80
2.4	0.48	100L-2	2900	4.9	1450	1.4
3.3	0.66	112M-2	2925	6.9	1475	2.3
4.4	0.88	132SA-2	2940	8.7	1465	2.5
6.1	1.2	132SB-2	2940	11.5	1465	2.9
8.3	1.7	160MA-2	2955	15.7	1480	4.0
12	2.4	160MB-2	2945	21.2	1470	5.2
17	3.4	160L-2	2940	30.0	1460	7.3
20	4	180M-2	2930	35.3	1470	8.6
24	4.8	200LA-2	2935	42.4	1475	10.3
33	6.6	200LB-2	2940	58	1475	14.2
41	8.2	225M-2	2940	72	1475	17.6
50	10	250M-2	2950	88	1480	21.5
61	12	280S-2	2950	108	1480	25.8
83	17	280M-2	2955	147	1480	36.5
99	20	315S-2	2955	175	1480	42.9
121	24	315MA-2	2955	214	1480	52
145	29	315LA-2	2960	256	1485	62
176	35	315LB-2	2960	311	1485	75

## 1500/1000 r/min = 4/6 Poles

### Fan duty – separate windings 人 / 人 (MBJ)

0.55	0.18	80B-4	1410	1.5	945	0.80
0.75	0.25	90S-4	1420	1.8	950	1.0
1.1	0.36	90L-4	1420	2.5	950	1.4
1.5	0.5	100LA-4	1430	3.5	960	1.7
2.2	0.75	100LB-4	1440	4.7	960	2.3
3	1	112M-4	1440	6.3	965	3.0
4	1.3	132S-4	1460	8.2	980	3.7
5.5	1.8	132M-4	1465	11	980	4.7
7.5	2.5	160M-4	1470	14.2	980	5.8
11	3.5	160L-4	1470	20.9	980	8.3
15	5	180L-6	1470	27.2	985	10.5
18.5	6.1	200LA-6	1475	33.5	985	12.0
22	7.3	200LB-6	1480	39.5	985	14.5
33	11	225M-6	1485	59	990	20.9
45	15	250M-6	1485	77	990	26.7
55	18	280M-6	1480	94	990	32.2
75	25	315S-6	1480	128	990	44.7
90	30	315MA-6	1480	154	990	54
110	36	315LA-6	1480	188	990	64
132	44	315LB-6	1480	226	990	79

Whilst we offer all 2 speed combinations (refer product code specifications on page 4) we list below the main two speed fan duty requirements.

High speed	Low speed	Frame	High speed		Low speed	
[ kW ]	[ kW ]		[ r/min ]	[ A ]	[ r/min ]	[ A ]

## 1500/750 r/min = 4/8 Poles

### Fan duty – single winding 人 / 人 (MAK)

0.6	0.12	80B-4	1410	1.7	670	0.57
0.8	0.16	90S-4	1430	2.0	700	0.70
1.2	0.24	90L-4	1430	2.9	700	1.0
1.7	0.34	100LA-4	1435	3.7	715	1.4
2.4	0.48	100LB-4	1430	5.0	720	1.8
3.3	0.7	112M-4	1435	6.5	720	2.2
4.4	0.9	132S-4	1455	8.6	730	2.8
6.1	1.2	132M-4	1460	11.9	730	4.0
8.3	1.7	160M-8	1450	15	730	4.2
12	2.4	160L-8	1455	21.2	735	5.7
17	3.4	180M-4	1475	31.0	740	9.1
20	4	180L-4	1475	37.0	740	11.3
24	5	200L-4	1475	41.1	740	11.8
33	6.6	225S-4	1480	56.5	740	15.3
41	8.2	225M-4	1480	72.6	740	20.4
50	10	250M-4	1480	84.8	740	23.5
61	12	280S-4	1485	105	745	27.3
83	17	280M-4	1485	143	740	38.7
99	20	315S-4	1485	170	740	45.5
121	24	315MA-4	1485	208	740	55
145	29	315LA-4	1485	250	740	66
176	35	315LB-4	1485	303	740	80

## 1000/750 r/min = 6/8 Poles

### Fan duty – separate windings 人 / 人 (MBN)

0.55	0.24	90S-6	945	1.5	700	0.94
0.75	0.32	90L-6	945	2.1	710	1.6
1.1	0.47	100L-6	950	2.7	710	1.6
1.5	0.65	112M-6	960	3.6	710	1.9
2.2	0.95	132S-6	975	5.6	730	3.1
3	1.3	132MA-6	975	7.2	730	4.1
4	1.7	132MB-6	975	9.3	730	5.1
5.5	2.4	160M-6	980	11.4	735	6.4
7.5	3.2	160L-6	980	15.1	735	8.4
11	4.7	180L-8	985	25.7	735	11.0
13	5.5	200L-8	985	24.9	735	11.5
15	6.5	225S-8	985	29.5	735	13.1
21	9	225M-8	985	984	735	17.7
26	11	250M-6	990	47.0	740	21.3
30	13	280S-6	990	56	740	25.8
37	16	280M-6	992	73	742	31.0
53	23	315S-6	990	105	740	44.6
65	28	315MA-6	990	128	740	54
80	34	315LA-6	990	158	740	66
92	40	315LB-6	990	182	740	78

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

# CMG

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### ELECTRIC MOTORS

- HGA series** Enhanced performance cast iron units MEPS2 (Eff 1) compliant
- SGA series** Enhanced performance cast iron units
- HLA series** Cast aluminium multi-mount units MEPS2 (Eff 1) compliant
- SLA series** Cast aluminium multi-mount units
- PPA series** High specification cast iron units
- XPA series** High specification / Premium efficiency cast iron units
- PPD series** Zone 1 Exd cast iron units
- MT series** Cast aluminium single & three phase units
- CT series** Air movement, pumping & general purpose application motors
- CW series** Australian made, special application & general purpose motors
- Centurion series** HTE & HCA series cast iron and fabricated steel high voltage motors
- MTx series** Cast aluminium single & three phase units - Extended range up to 200 frames

### AC DRIVES & SOFTSTARTERS

- Vacon NX** Vacon frequency converters
- Lovato ADX** Softstarters with torque control

### GEAR MOTORS

- Nordbloc-HGA** Euro dimension inline units
- Nordunicase-HGA** Heavy duty inline and flat helical units
- Nordbevel-HGA** Heavy duty helical bevel units
- Nordworm-HGA** All cast iron motor & wormbox units
- FRT-MTT/HLA** All aluminium universal mount wormbox units
- FRS-HGA** All cast iron motor & wormbox units
- FRS-MTT/HLA** All aluminium motor & wormbox units
- FRD-MTT/HLA** All aluminium Euro dimension inline units
- C&H SLA** High ratio inline multi-stage spur units
- Cycloid 600** Compact High Efficiency Cycloidal speed reducers
- Geardrive** C-frame sub-fractional horsepower units
- SMR®** Helical shaft mounted reducers
- CRT-MTT/HLA** All aluminium universal mount wormbox units

### OTHER

- Corporate Brochure & Product Selection Guide

Please note: not all products are available worldwide.