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LATEST NEW CATALOGUE

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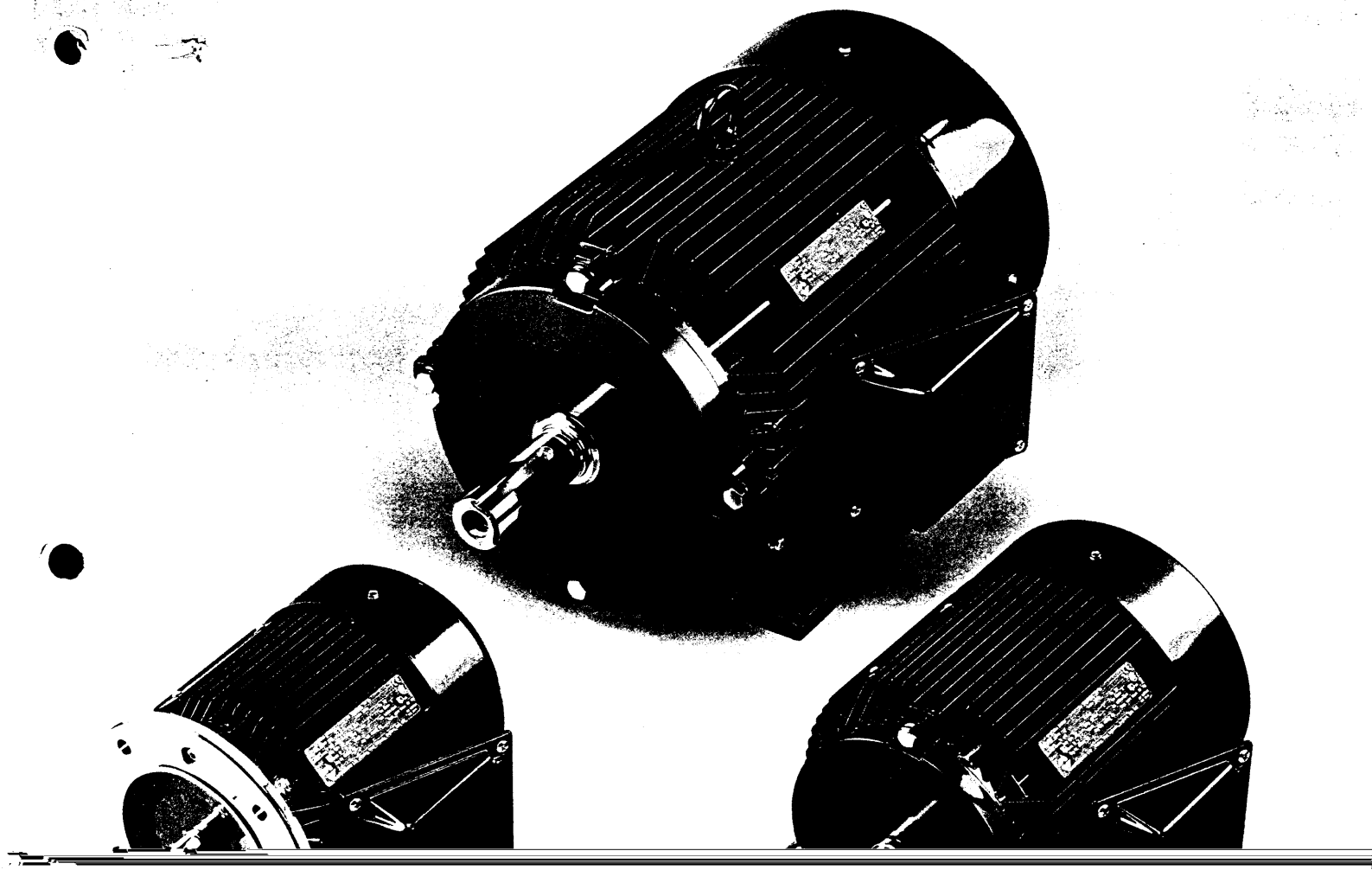
IP55 3-PHASE MOTORS
MOTORI IP55 TRIFASI

ALUMINIUM CONSTRUCTION
COSTRUZIONE IN ALLUMINIO

FRAME SIZES 63 TO
GRANDEZZE DALLA

Alpak II



CONTENTS

HOW TO USE THIS CATALOGUE

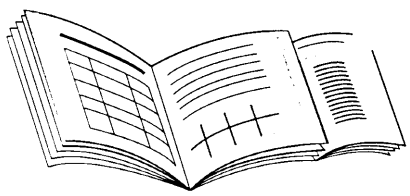
This catalogue is split into distinct sections:-

- Introduction
- Directives, Standards and Environment
- Electrical Characteristics
- Mechanical Characteristics
- Variants
- Installation, Spare Parts and Maintenance
- Performance Data and Dimensions

This catalogue describes Alpak II Motors in frames DA63 to DA250S. Two specifications of motors are available to meet international requirements as detailed below.

- BS Specification
  - Terminal box position – Right
  - Terminal box material – Steel or aluminium
  - Cable entry – Metric, knockouts
- European Specification
  - Terminal box position – Top
  - Terminal box material – Aluminium
  - Cable entry – Drilled for PG

For ease of use, additional fold-out flaps are located at the back of the catalogue. These are designed to be used in conjunction with pages detailing performance data and dimensions.



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ALPAK II FROM ELECTRODRIVES

Electrodrives (formerly GEC Alsthom Electromotors) is part of the multi-national industrial drives group Brook Hansen, a European leader in the manufacture of electric motors. Alpak aluminium motors have been manufactured for over 20 years with over four million produced to date.

Alpak II encompasses an improvement in design using Brook Hansen's world leading 'W' electric motor technology (which has received the 1996 Queen's Award for Environmental Achievement), whilst retaining the established strengths of Alpak.

Higher efficiencies and reduced noise levels are the benefits this technology brings to a motor that already includes:

- IP55 standard enclosure
- Metal external parts
- Aesthetic design

Reduced running costs and inherent reliability ensure low lifetime costs for the user and peace of mind for equipment manufacturers incorporating Alpak II into their products.

Electrodrives manufactures Alpak II as a complete range of aluminium frames from frame sizes 63 to 250, with outputs up to 55kW from a single factory near Birmingham, UK. This enables a fully co-ordinated service to be readily provided,

A two year warranty underpins Electrodrives' confidence in Alpak II reliability.

Internationally, a network of distributors provides local sales and service support enabling Alpak II motors to be exported world-wide with confidence.

BSI REGISTERED FIRM
NATIONAL ACCREDITATION OF CERTIFICATION BODIES

Cert No FM392

EUROPEAN DIRECTIVES

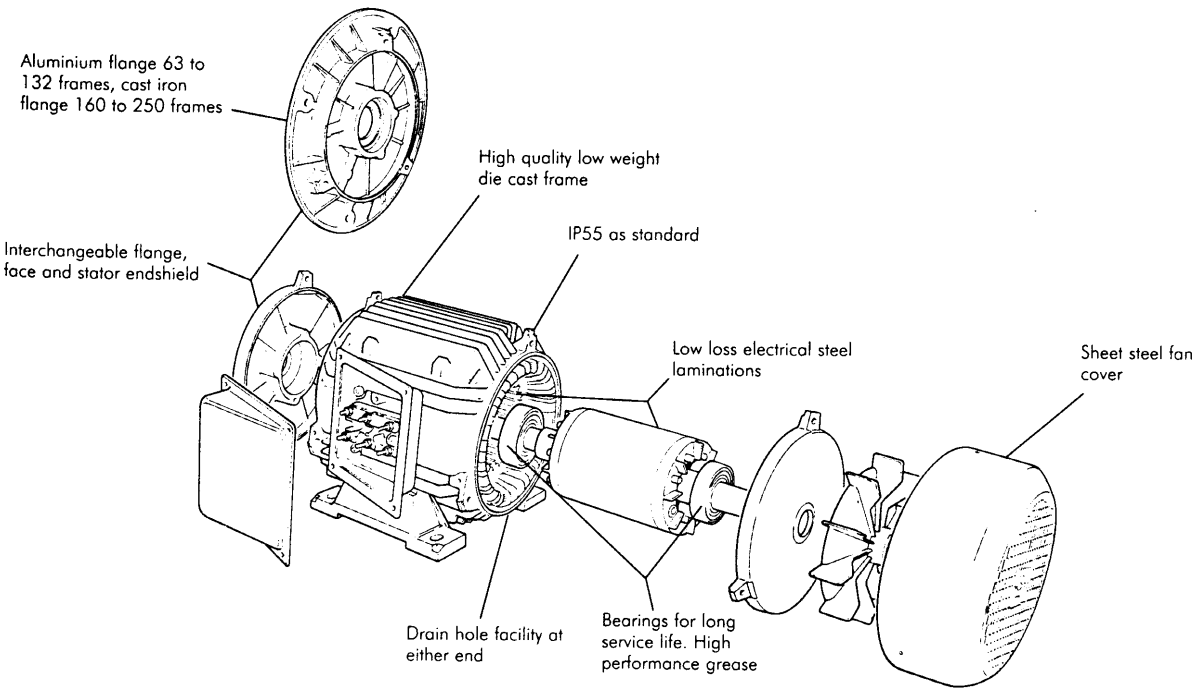
Three European Directives apply in varying degrees to AC induction motors. Electrodrives complies in the following manner:-

TABLE 1: COMPLIANCE WITH EUROPEAN DIRECTIVES APPLYING TO AC INDUCTION MOTORS

Directive	Low Voltage (LV)	Machinery (MD)	Electromagnetic Compatibility (EMC)
Reference Numbers	73/23/EEC 93/68/EEC	89/392/EEC 91/368/EEC 93/44/EEC 93/68/EEC	
Motor CE marked	Yes	No	No
Standards	BS EN 60034	Not applicable	
Documentation for Customers' Technical File	Declaration of Conformity	Certificate of Incorporation	Statement*
Safety Instructions with every motor	Yes	Yes	
Comment	Relevant electrical equipment operating between 50 to 1000 volts AC	Component	Component

* Motors operating from a correctly applied, sinusoidal (AC) supply meet the requirements of the EMC Directive and are within the limits specified in standards EN50081 and EN50082 for Industrial, (Part 2) and Residential, Commercial and Light Industrial Environments (Part 1).

ALPAK II MOTOR CONSTRUCTION



STANDARDS AND ENVIRONMENT

RANGE

The Alpak II range covers frame sizes 63 to 250. Outputs from 0.18kW to 55kW (Class B temperature rise).

STANDARDS

All motors meet the requirements of IEC 34-1, BS5000 Part 10 or Part 99 and the relevant parts of BS EN 60034 and BS4999.

TABLE 2: STANDARDS

	IEC	BS
Frame sizes	IEC 72	BS4999 Part 141
Dimensions	IEC 72-1	BS4999 Part 141
Ratings	IEC 34-1	BS EN 60034-1

ENCLOSURE AND PROTECTION

The standard motor enclosure is to IP55 (weatherproof, hoseproof and dustproof). The designation used for the degree of protection conforms to the IP code of IEC 34-5 and BS4999 Part 105, which consists of the letters IP followed by two characteristic numerals. The most commonly occurring characteristic numerals for the Alpak range are given in table 3:

TABLE 3: ENCLOSURE DESCRIPTION

1st Numeral	2nd Numeral

NORMAL LIMITS OF AMBIENT TEMPERATURE

Standard motors are designed to operate at the listed Maximum Continuous Ratings (S1) with a temperature rise not exceeding 80°C in an ambient not exceeding 40°C and an altitude not exceeding 1000 metres at 400V. Standard motors may operate in ambient temperatures down to -30°C.

VARIATION IN OUTPUT WITH AMBIENT TEMPERATURE

If the ambient temperature is above 40°C, the rated output should be adjusted to give a total motor winding temperature not exceeding 120°C, as detailed in table 4.

TABLE 4: AMBIENT TEMPERATURE

Ambient or Cooling Air Temperature °C	Appropriate Permissible Output (% Standard Rating)
40.0	100.0
45.0	95.0
50.0	90.0
55.0*	85.0

* Note for ambient temperatures of 51°C to 55°C a nylon fan should be fitted. For ambient temperatures exceeding 55°C and less than -30°C, please refer to your local sales office.

VARIATION IN OUTPUT WITH ALTITUDE

When a standard motor is operating in conditions where the coolant air temperature is specified at 40°C and the altitude is between 1000m and 4000m, the rated output should be adjusted in accordance with table 5.

When the site is between 1000m and 4000m altitude, and the ambient temperature is not specified, it is assumed that the ambient air is cooler, hence compensating for the reduced pressure. In such instances, no reduction in output or permissible motor temperature rise is necessary.

Table 6 lists ambient temperatures to maintain standard temperature rises and outputs at high altitudes.

TABLE 5: ALTITUDE AT 40°C

Altitude above Sea	Appropriate Permissible

COMBINED EFFECTS OF AMBIENT TEMPERATURE AND ALTITUDE

When both the temperature of the coolant air and the site altitude differ from the standard, the approximate permissible output is obtained by multiplying the factors given above for each variable.

Example 1

Standard rating required 15kW

Coolant air temperature 45°C (factor 95%)

Altitude 2000m (factor 92%)

Effective modified output rated at 40°C and 1000m

$$= \frac{15}{0.95 \times 0.92}$$

$$= 17.2\text{kW}$$

The frame size should be selected on the basis of 17.2kW or the nearest standard rating of 18.5kW.

Example 2

Standard motor available at 11kW (40°C ambient and 1000m altitude).

Operating conditions

Ambient 50°C = factor of 90%

Altitude 1500m = factor of 95.5%

Effective Rating = 11 x 0.90 x 0.955

= 9.5kW

TABLE 6: ALTITUDE AND AMBIENT TEMPERATURE

Altitude above Sea Level (Metres)	Assumed Ambient Temperature °C (80°C List)
1000	40.0
1500	36.0
2000	32.0
2500	28.0
3000	24.0
4000	16.0

ENVIRONMENTAL PROTECTION AND FINISH

A high quality engineered paint finish is applied to all motors. All aluminium components are pre-treated prior to

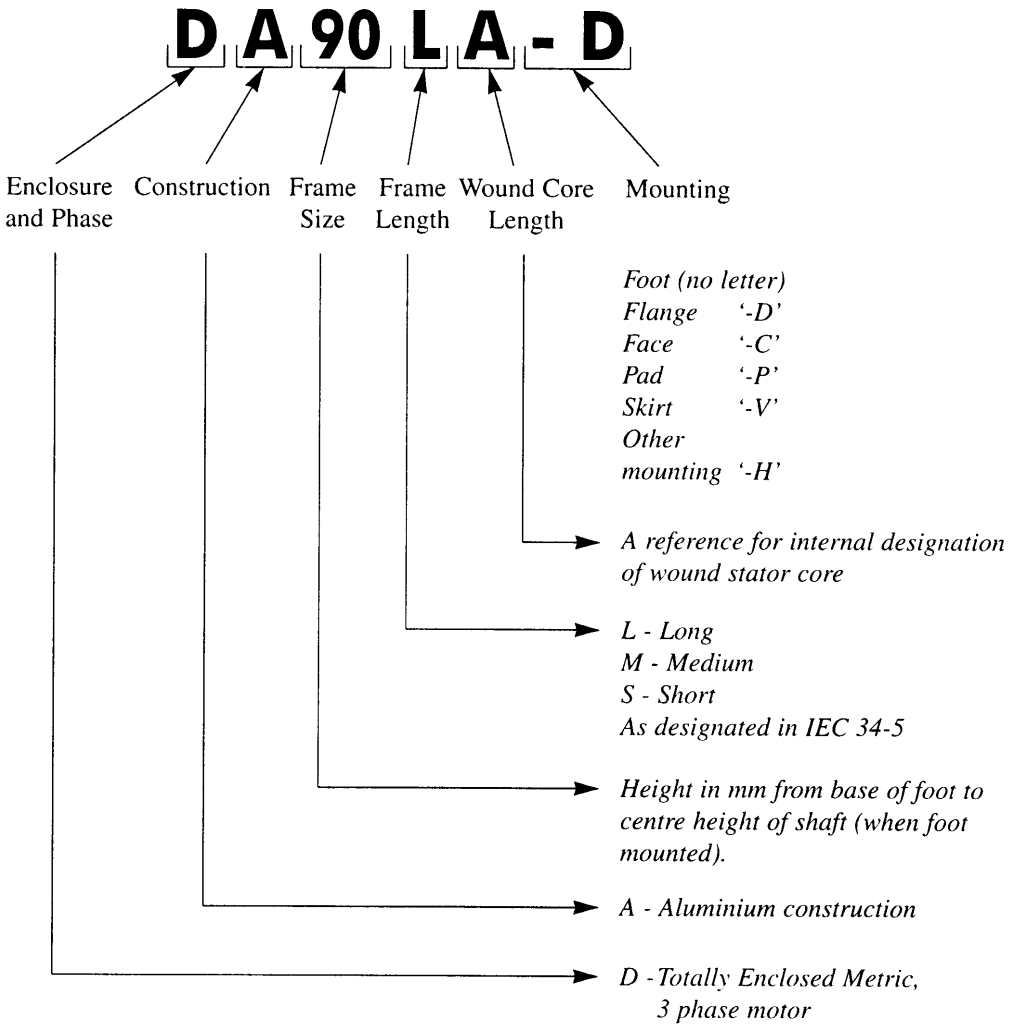
TROPICAL PROTECTION

A full tropical finish can be specified. This consists of non-hygroscopic varnish sprayed onto the inside of the fan cover, terminal box and lid, rotor, inside of

NOMENCLATURE

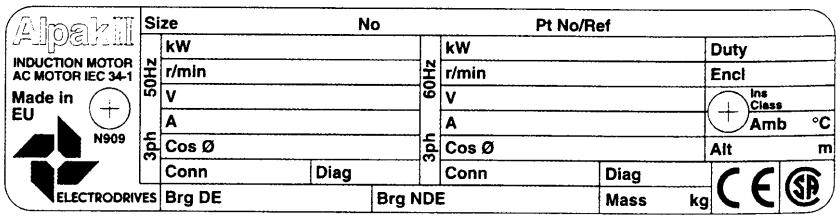
FRAME DESCRIPTION

The frame coding for all Alpak II motors is used to identify the different designs, frame sizes and mountings. Detailed below is an example of a 90 frame, flange mounted motor.



RATING PLATE

Motors are fitted with anodised aluminium rating plate. The data on the plate is laser etched, controlled by the latest computer software for accuracy and clarity.

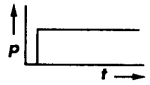
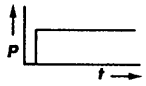
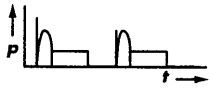
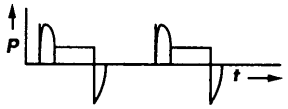
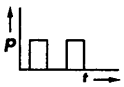
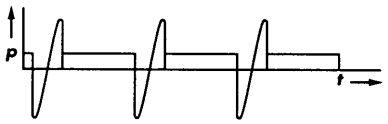
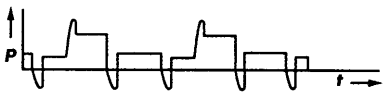
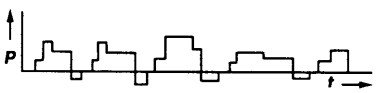


ELECTRODRIVES

DUTY CYCLES

All motors detailed in this catalogue are designed for continuous running duty (S1). Many motors are not used for continuous duty. They may be used for temporary duty or intermittent duty as described in table 7.

TABLE 7: DUTY CYCLES

Duty Type	Explanation	Diagrams
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 and de-energised period of sufficient duration to re-establish machine temperature within 2K of the coolant.	
S3 Intermittent Periodic Duty without influence of running-up period	A sequence of identical duty cycles, each including a period of operation at constant load and a rest and de-energised period. In this duty the cycle is such that the starting current does not significantly affect the temperature rise.	
S4 Intermittent Periodic Duty with influence of running-up period	As S3, but with each cycle, including a significant period of starting.	
S5 Intermittent Periodic Duty with influence of running-up period and electrical braking	As S4, but with each cycle, including a period of rapid electric braking.	
S6 Continuous-Operation Periodic Duty	A sequence of identical duty cycles, each cycle consisting of a period of operation at constant load and a period of operation at no-load. There is no rest and de-energised period.	
S7 Continuous-Operation Periodic Duty with starting and electrical braking	As S6, with each cycle including a period of starting and a period of electric braking.	
S8 Continuous-Operation Periodic Duty with relative load speed changes.	Continuous-operation with speed and load changes which includes braking.	
S9 Duty With Non-Periodic Load and speed variations.	A series of non-identical load cycles which includes starting and braking.	

p=output power
t=time

S10 Duty with discrete constant load. For more details of the above, please refer to BS4999 Part 101. For a continuous duty S1 motor to be used for any other duty, it may have to be re-rated. For further information please refer to your local sales office.

TECHNICAL INFORMATION: ELECTRICAL

WINDINGS AND INSULATION

Class F insulation system is used for Alpak motors. It is capable of operating at a temperature rise of 105°K above a 40°C ambient. This consequently greatly increases the thermal life of the motor in comparison with a motor operating at the Class F limits.

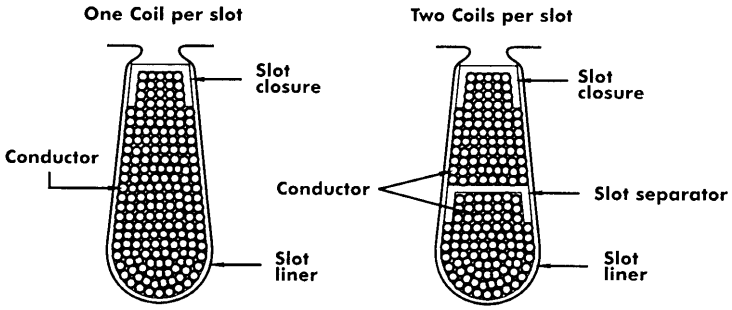
If full use is made of the increased temperature rise of Class F (ie. the extra 25°K) the standard motor can cope with:-

- Abnormal supply conditions
- Abnormal operating conditions
- Increased load
- Increased ambient temperatures
- Higher altitudes
- A combination of the above factors

PROTECTION OF WINDINGS

The integral system of wire insulation, slot and phase sheet insulation and the overall varnish impregnation withstands high moisture, injurious deposits and chemical contamination. The impregnation provides tracking protection together with a winding rigidity that is capable of withstanding the vibration limits imposed by industrial drives.

TYPICAL STATOR SLOT ARRANGEMENTS



VOLTAGE

In January 1995 the first steps to a unified 'Eurovoltage' of 400 volts ±10% were taken. The current situation is detailed in table 8.

Alpak motors are wound to operate from a 'Eurovoltage' supply of 380/400/415 volts, 50Hz.

Motors up to and including 4kW are supplied for operation on either of two voltages by reconnection (usually 220–240/380–415V, 50Hz).

Motors can be wound for any voltage in the range at 200–690 volts, details available from your local sales office.

OPERATION AT 60Hz

All standard 50Hz motors may operate on a 60Hz supply with an increase in speed of 20%.

If the supply voltage at 60Hz is the same as the 50Hz rated voltage, then there is no increase in output and torque performance is reduced.

If the supply voltage at 60Hz is 10% to 20% higher than the rated voltage of the motor at 50Hz, then the output can be increased by 10% to 15% dependent on frame size/poles.

TABLE 8: VOLTAGE HARMONISATION

Date	Location	Voltage V	Comments
Pre 1995	UK	415 ±6%	-
1.1.95	UK	400+10/-6%	No real change to supplied voltage range
2003	UK	400±10%	-
Pre 1995	Mainland Europe	380±5%	-
1.1.95	Mainland Europe	400+6/-10%	-
2003	Mainland Europe	400±10%	-

TABLE 9: PROTECTION DEVICES

Motor Fault	Control Gear		Embedded in Motor Windings	
	Thermal Overload	Magnetic Overload	Thermostats	Thermistors
Sustained overload	G	G	G	G
Excessive or incorrect duty cycle	A	A	A	G
Prolonged reduced or over voltage on incorrect frequency	A	A	G	G
Excessive ambient temperature in motor location	P	P	G	G
Restricted or impaired ventilation	P	P	G	G
Single phasing	P	P	A	G
Stalled or locked rotor	G	G	A	G

Key: G – good; A – acceptable; P – poor/little or no protection.

PROTECTION DEVICES

To protect motor windings against a variety of operational malfunctions, motors and associated control gear can be fitted with protection devices as detailed in table 9.

ELECTRICAL PROTECTION

Standard motors are suited to the normal overload/stall protection offered by standard thermal or magnetic overload starters. For additional protection, thermistors are recommended.

THERMISTORS

Thermistors are semiconducting resistance devices with a positive temperature co-efficient usually with a fixed reference temperature of 160°C.

THERMOSTATS OR THERMAL SWITCHES

These are bi-metallic devices with a non-adjustable temperature switching point of 150°C.

The choice of protection employed will depend upon varied factors including:

- The possible causes of thermal overload in a particular application
- The value of products being processed
- The cost incurred through loss of production
- The possibility of dangerous conditions being created by motor failure.

TERMINAL BOX

All motors are dispatched with a fully sealed terminal box, giving IP56 protection to the terminal enclosure.

TERMINAL MARKINGS

Motor terminals are identified in accordance with IEC 34-8 and BS4999 Part 145.

SPECIAL TERMINATIONS

Loose leads without terminal board can be provided on request.

EARTHING

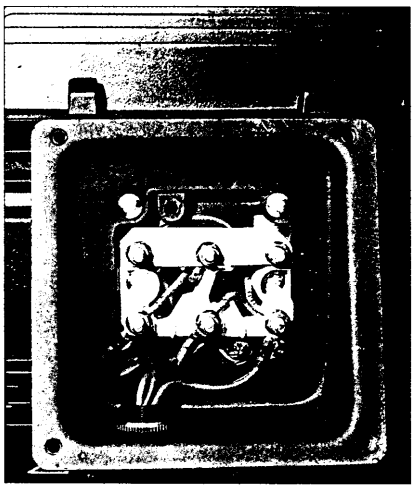
Earthing points located inside the terminal box are provided as standard on all motors and are marked with the international symbol. External earthing points can be provided on request.

Terminal boxes can be rotated to give four conduit entry positions at 90° intervals. Shrouded auxiliary terminals are housed in the main terminal box. Motors can be supplied with loose leads which must be protected by steel or flexible conduit. Alternatively a terminal box and connection block for remote mounting can be provided.

TABLE 10: TERMINAL BOX DETAILS

Frame size	Position when viewed at the drive end			Material
	Top	Right	Left	
63/71	Std	N/A	N/A	Steel
80-180	Alt	Std	Alt	Steel
200-250	Alt	Std	Alt	Aluminium

Std – Standard, Alt – Alternative,
N/A – Not available.



TECHNICAL INFORMATION: ELECTRICAL

RATED OUTPUT

All standard Alpak induction motors are designed to operate within Class B temperature rise (80°K/40°C), but are constructed with a Class F insulation system.

The tables 11 to 14 show the standard ratings at Class B temperature rise and also the maximum ratings utilising the Class F temperature rise.

ROTATION

Standard rotation is clockwise when viewed from the drive end of the motor.

Counter clockwise rotation can be obtained by changing over the supply leads such that the alphabetical sequence is not maintained.

ROTATIONAL SPEED

Rotational speed expressed in min^{-1} at rated output. The frequency/speed relationship is

$$n = \frac{120f}{p}$$

where

n= synchronous speed, min^{-1}

f= frequency, Hz

p= number of poles

No. Of Poles	n min^{-1}	
	50Hz	60Hz
2	3000	3600
4	1500	1800
6	1000	1200
8	750	900

The difference between synchronous and rated speed is due to the loading of the motor.

The slip on an induction motor is defined as:

$$\text{Slip} = \frac{\text{syn speed - rated speed}}{\text{syn speed}} \times 100\%$$

TABLE 11

Frame Size	Rating Class B	Rating Class F
3000 min^{-1} (2 pole)		
DA63MA	0.25	0.30
DA71MA	0.37	0.45
DA71MA	0.55	0.65
DA80MA	0.75	0.90
DA80MB	1.1	1.25
DA90SA	1.5	1.7
DA90LA	2.2	2.5
DA100LA	3.0	3.4
DA112MA	4.0	4.5
DA132SA	5.5	6.2
DA132SB	7.5	8.4
DA160MA	11.0	12.5
DA160MB	15.0	17.0
DA160LA	18.5	21.0
DA180MA	22.0	25.0
DA200LA	30.0	34.0
DA200LB	37.0	42.0
DA225MA	45.0	50.0
DA250SA	55.0	62.0

TABLE 12

Frame Size	Rating Class B	Rating Class F
1500 min^{-1} (4 pole)		
DA63MA	0.18	0.22
DA71MA	0.25	0.30
DA71MA	0.37	0.40
DA80MA	0.55	0.65
DA80MB	0.75	0.90
DA90SA	1.1	1.30
DA90LA	1.5	1.7
DA100LA	2.2	2.5
DA100LB	3.0	3.4
DA112MA	4.0	4.5
DA132SA	5.5	6.2
DA132MA	7.5	8.4
DA160MA	11.0	13.0
DA160LA	15.0	17.0
DA180MA	18.5	21.0
DA180LA	22.0	25.0
DA200LA	30.0	34.0
DA225SA	37.0	42.0
DA225MA	45.0	50.0
DA250SA	55.0	62.0

TABLE 13

Frame Size	Rating Class B	Rating Class F
1000 min^{-1} (6 pole)		
DA80MA	0.37	0.45
DA80MA	0.55	0.65
DA90SA	0.75	0.90
DA90LA	1.1	1.25
DA100LA	1.5	1.8
DA112MA	2.2	2.5
DA132SA	3.0	3.6
DA132MA	4.0	4.5
DA132MB	5.5	6.2
DA160MA	7.5	9.0
DA160LA	11.0	12.0
DA180LA	15.0	16.5
DA200LA	18.5	23.0
DA200LB	22.0	26.0
DA225MA	30.0	34.0
DA250SMA	37.0	41.0

TABLE 14

Frame Size	Rating Class B	Rating Class F
750 min^{-1} (8 pole)		
DA90SA	0.37	0.45
DA90LA	0.55	0.65
DA100LA	0.75	0.90
DA100LA	1.1	1.25
DA112MA	1.5	1.7
DA132SA	2.2	2.5
DA132MA	3.0	3.6
DA160MA	4.0	5.0
DA160MA	5.5	6.5
DA160LA	7.5	8.5
DA180LA	11.0	12.5
DA200LA	15.0	17.5
DA225SA	18.5	20.0
DA225MA	22.0	24.0
DA250SA	30.0	33.0

TECHNICAL INFORMATION: MECHANICAL

BEARINGS

Standard Alpak II motors are fitted with single row, deep-grooved ball bearings:

- 63-180 are double sealed or shielded
- 200-250 are unshielded within an inner cap arrangement.

VIBRATION

All rotor assemblies are dynamically balanced before final assembly with a half key, this is in accordance with BS4999 Part 142 Table 1. There are 3 grades of balance available as detailed in table 16.

SHAFTS

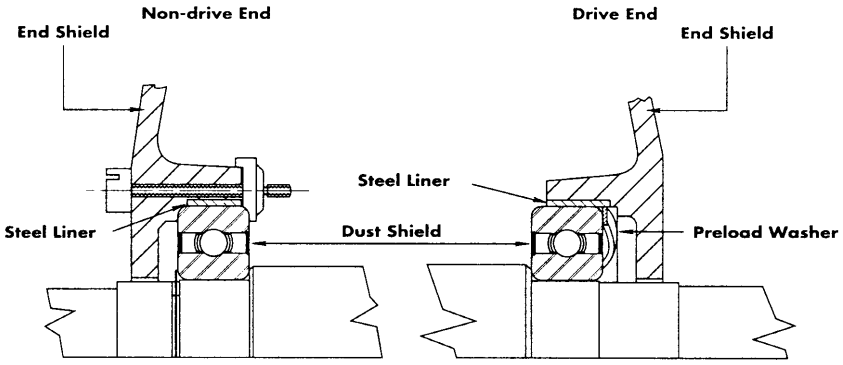
Shafts are produced from 35/40 Ton (460/540 MN/m^2) tensile steel. Drive end shafts are provided with a tapped hole to DIN 332 Form D and a closed or open profile keyway depending on BS or European specification.

BEARING LOADS

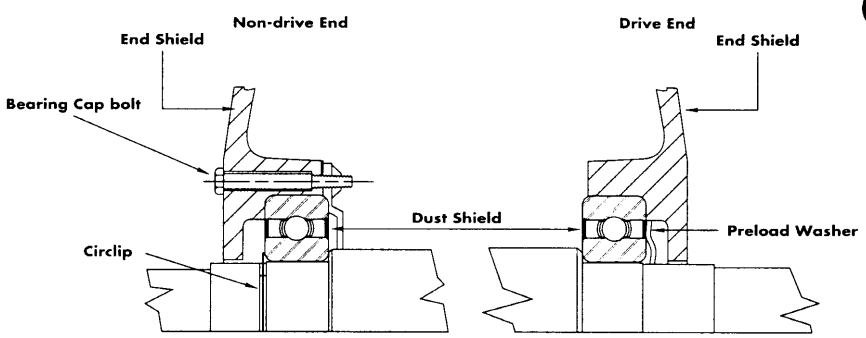
TECHNICAL INFORMATION: MECHANICAL

BEARING LOCATION

- 63/71 frames are not provided with bearing retention devices at the non-drive end as standard, but means of drive end location can be provided.
- 80-132 frame. The rotor assembly is located at the non-drive end by a patented retention device.
- 160/180 frames. The rotor assembly is located at the non-drive end by a pressed steel bearing cap.
- 200-250 frames which incorporate lubrication points; aluminium bearing caps are fitted at both ends, the non-drive end cap providing the location.

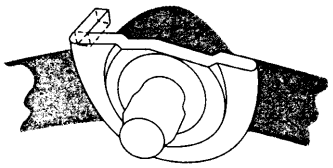


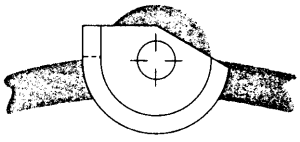
D80-132 bearing location



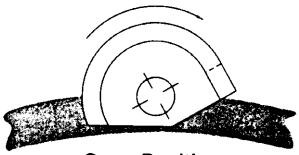
D160-180 bearing location

Patented Bearing Retention Device

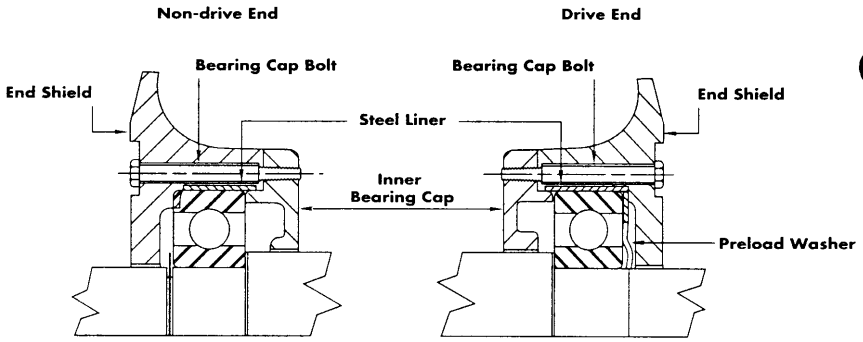




Closed Position



Open Position

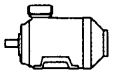


D200-250 bearing location

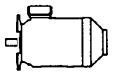
TECHNICAL INFORMATION: MECHANICAL

TABLE 18: MOUNTING OPTIONS

Horizontal Shaft



B3 IM 1001
Foot mounted.

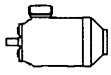


B5 IM 3001
Flange at D.E.
No feet.

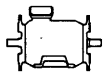
B6 IM 1051
Foot wall mounted with feet on left-hand side when viewed from D.E.

B7 IM 1061
Foot wall mounted with feet on right-hand side when viewed from D.E.

B8 IM 1071
Ceiling mounted with feet above motor.

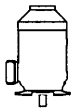


B14 IM 3601
Face at D.E.
No feet.



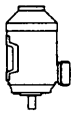
B17 IM 2302
or IM 2202
2 Faces or flanges.
Foot mounted.

Vertical Shaft



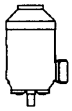
V1 IM 3011
Flange at D.E.
Shaft down.
No feet.

V3 IM 3031
Flange at D.E.
Shaft up.
No feet.



V5 IM 1011
Vertical Foot.
Wall mounted.
Shaft down.

V6 IM 1031
Vertical Foot.
Wall mounted.
Shaft up.



V18 IM 3611
Face at D.E.
Shaft down.
No feet.

V19 IM 3631
Face at D.E.
Shaft up.
No feet.

ALTERNATIVE FLANGE

IEC flange ref.		FF115	FF130	FF165	FF215	FF265	FF300	FF350	FF400	FF500
	P	140	160	200	250	300	350	400	450	550
	M	115	130	165	215	265	300	350	400	500
Frame Size	N	95	110	130	180	230	250	300	350	450
DA63M		S	B							
DA71M		B	S							
DA80M			A	S	B					
DA90S & L			A	S	B					
DA100L				A	S	B				
DA112M				A	S	B				
DA132S & M					A	S				
DA160M & L						A	S			
DA180M &L						A	S			
DA200L								S	A[1]	
DA225S & M								A	S	B
DA250S								A	A[1] B	S

ALTERNATIVE FACE

IEC flange ref.		FT75	FT85	FT100	FT115	FT130	FT165	FT215
	P	90	105	120	140	160	200	250
	M	75	85	100	115	130	165	215
Frame Size	N	60	70	80	95	110	130	180
DA63M		S	B		B	B		
DA71M		B	S		B	B		
DA80M				S	B[ø]	B		
DA90S & L					S	B	B	
DA100L					B	S	B	
DA112M					B	S	B	
DA132S & M							S	
DA160M & L								S
DA180M & L								A*

* Maximum shaft extension diameter is 42mm.
ø Irregular external diameter. Maximum 'P' dimension is locally 130mm.
[1] 2 Pole only

Notes
S- indicates available as standard using a standard shaft.
A- indicates available as alternative with a non-standard overall length shaft.
B- indicates available as alternative with a standard shaft.
The tolerance on spigot 'N' is in accordance with BS4999:Part 141.

When using flange variation 'A', dimension C on foot and flange mounting motors may not comply with BS4999: Part 141.

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TECHNICAL INFORMATION: MECHANICAL

TABLE 19 (cont): MAXIMUM PERMISSIBLE EXTERNAL AXIAL AND RADIAL LOADS IN NEWTONS AT 50Hz*

Frame Size	Poles	Rated Output	Bearing		Thrust Load (Newtons)				Maximum Radial Load at end of Standard Shaft †
					Horizontal Mounting Typical Mounting IM 1001		Vertical Mounting Typical Mounting IM3011§		
					Towards Motor	From Motor	Up	Down	
		kW	Drive End	Non-Drive End	N	N	N	N	N
DA160M	2	11, 15	63092Z	62092Z	2638	3848	2893	3693	2511
	4	11	63092Z	62092Z	2947	4157	3249	3971	2507
	6	7.5	63092Z	62092Z	3145	4355	3523	4121	2497
DA160L	2	18.5	63092Z	62092Z	2589	3799	2875	3623	2509
	4	15	63092Z	62092Z	2898	4108	3258	3887	2500
	6	11	63092Z	62092Z	3081	4291	3527	4015	2497
DA180M	2	22	63102Z	62092Z	2482	3856	2814	3654	3408
	4	18.5	63102Z	62092Z	2758	4123	3171	3878	3397
DA180L	4	22	63102Z	62092Z	2708	4082	3135	3819	3391
	6	15	63102Z	62092Z	2776	4150	3410	3761	3389
DA200L	2	30, 37	6312	6312	5598	7410	6298	6980	5610
	4	30	6312	6310	4403	6215	5153	5755	5597
	6	18.5, 22	6312	6310	4782	6594	5654	6060	5569
DA225S	4	37	6313	6312	6722	7712	7633	7155	5995
	8	18.5	6313	6312	7620	8610	8668	7968	5994
DA225M	2	45	6313	6312	5567	7379	6420	6853	5607
	4	45	6313	6312	6606	7596	7736	6903	5984
	6	30	6313	6312	7123	8113	8447	7302	5984
DA250S	2	55	6313	6312	5923	6913	6780	6386	6005
	4	55	6315	6312	6437	7439	7615	6719	8866
	6	37	6315	6312	6923	7925	8253	7116	9047

All figures are based on a Lna bearing life of 20,000 hours. Lna=adjusted L10 life rating taking into account reliability, material improvements, lubrication.
Bearing loads for 8 pole ratings are identical or in excess of those stated for equivalent 6 pole machines.

§Values quoted are for motor mounted shaft down.

* The non-drive end bearing (located on DA80 to DA250) takes the thrust load in all cases.

† Radial loads must not be applied beyond the end of the standard drive end shaft extension.

TABLE 20: VARIABLE VOLTAGE OUTPUT

4 Pole (1500 min^{-1} Synchronous Speed @ Full Voltage)						6 Pole (1000 min^{-1} Synchronous Speed @ Full Voltage)					
Type	**P_N kW**	**n min^{-1}**	**1.0P_N I_N A**	**Peak Load I_N A**	**η 1.0P_N**	**Type**	**P_N kW**	**n min^{-1}**	**1.0P_N I_N A**	**Peak Load I_N A**	**η 1.0P_N**
DA71MA	0.30	1340	1.2	1.2	56.0	DA90LA	1.0	850	3.7	3.7	64.0
DA80MB	0.65	1335	1.8	1.8	76.0	DA100LA	1.3	890	3.7	3.7	75.0
DA90LA	1.1	1400	2.9	3.1	78.0	DA112MA	1.6	905	5.0	5.0	74.0
DA100LB	1.5	1450	4.9	5.7	86.0	DA132MA	2.9	950	12.5	12.5	72.0

ALPAK II MOTORS FOR INVERTERS

DATA REQUIRED TO DETERMINE MOTOR SIZE FOR USE ON INVERTERS

To select the correct motor for inverter duty establish:

- 2, 4 or 6 poles.
- Load type (variable torque, constant torque or constant kW).
- Speed range required.
- Maximum absorbed power of the load referred to base frequency or speed.
- Select appropriate motor from table 21.

FORCE VENTILATED MOTORS

The use of a specially designed, force cooled motor, with a separately driven constant speed fan can overcome the de-rating problems associated with inverter drives. The separately driven fan is used to provide effective cooling at all motor speeds. Details available from your local sales office.

TACHOGENERATORS AND ENCODERS

Motors can be fitted with tachogenerators or encoders. Details available from your local sales office.

MOTOR RATINGS

Table 21 provides a guide to inverter motor selection. The ratings listed on inverter installations installed within the following parameters:

Total harmonic distortion	<6%
Peak voltage	1400V max
Max dv/dt	5.6 kV/microsec
Max carrier switching frequency	15kHz
Max cable length	100m

There are often good reasons to operate outside these parameters in which case please refer details to Electrodrives to confirm the motor frame size.

TABLE 21: INVERTER DRIVEN MOTOR RATINGS – CLASS F TEMP RISE

Frame Size	Mains Output 50Hz Class B rise P_N-kW	Variable Torque 50–2.5Hz P_N-kW	Constant Torque 50–25Hz P_N-kW	Constant Torque 50–16.7Hz P_N-kW	Constant Torque 50–10Hz P_N-kW	Constant Torque 50–5Hz P_N-kW	Constant Torque 50–2.5Hz P_N-kW	Constant Power 50–100Hz P_N-kW
2 pole (3000 min^{-1}) synchronous speed @ 50Hz								
DA80MA	0.75	0.8	0.8	0.7	0.6	0.5	0.5	0.75
DA80MB	1.10	1.2	1.1	1.0	0.9	0.8	0.7	1.1
DA90SA	1.5	1.6	1.6	1.4	1.2	1.1	1.0	1.5
DA90LA	2.2	2.4	2.3	2.1	1.8	1.6	1.4	2.2
DA100LA	3.0	3.2	3.1	2.8	2.5	2.2	1.9	3.0
DA112MA	4.0	4.3	4.2	3.7	3.3	2.9	2.6	4.0
DA132SA	5.5	5.9	5.7	5.1	4.6	4.0	3.5	5.5
DA132SB	7.5	8.1	7.8	7.0	6.2	5.5	4.8	7.5
DA160MA	11.0	11.0	10.7	9.6	8.5	7.5	6.6	11.0
DA160MB	15.0	15.0	14.6	13.1	11.6	10.2	9.0	15.0
DA160LA	18.5	18.5	17.9	16.1	14.2	12.6	11.1	18.5
DA180MA	22.0	22.0	21.3	19.1	16.9	15.0	13.2	22.0
DA200LA	30.0	30.0	29.1	26.1	23.1	20.4	18.0	30.0
DA200LB	37.0	37.0	35.9	32.2	28.5	25.2	22.2	37.0
DA225MA	45.0	45.0	43.7	39.2	34.7	30.6	27.0	45.0
DA250SA	55.0	55.0	53.4	47.9	42.4	37.4	33.0	55.0

ALPAK II
MOTORS FOR INVERTERS

TABLE 21 (cont): INVERTER DRIVEN MOTOR RATINGS – CLASS F TEMP RISE

Frame Size	Mains Output 50Hz Class B rise P_N-kW	Variable Torque 50–2.5Hz P_N-kW	Constant Torque 50–25Hz P_N-kW	Constant Torque 50–16.7Hz P_N-kW	Constant Torque 50–10Hz P_N-kW	Constant Torque 50–5Hz P_N-kW	Constant Torque 50–2.5Hz P_N-kW	Constant Power 50–100Hz P_N-kW
4 pole (1500 min^{-1}) synchronous speed @ 50Hz								
DA80MA	0.55	0.6	0.6	0.5	0.4	0.4	0.3	0.55
DA80MB	0.75	0.8	0.8	0.7	0.6	0.5	0.5	0.75
DA90SA	1.1	1.2	1.1	1.0	0.9	0.8	0.7	1.1
DA90LA	1.5	1.6	1.5	1.4	1.2	1.1	0.9	1.5
DA100LA	2.2	2.4	2.2	2.0	1.8	1.5	1.4	2.2
DA100LB	3.0	3.2	3.0	2.7	2.4	2.1	1.9	3.0

BRAKE MOTORS

Alpak brake motors are fitted with a fail-safe spring applied magnetic brake. Brakes are proven and tested to ensure complete safety and reliability in all operating conditions.

Brakes are DC spring applied electrically released types, such that on interruption, or failure of the power supply, the brake will engage and arrest the load. The brake coil is fed via a rectifier mounted in the motor terminal box and is automatically switched with the AC motor supply.

Brake motors are ruggedly constructed for continuous start/stop and holding duties in applications such as:

- Automatic warehousing equipment
- Banding and strapping machines
- Bar loading magazines
- Bending machines
- Bottle filling and packaging machines
- Cable drum drives
- Car wash plants
- Conveyor drives
- Door drives
- Escalators*
- Food lifts
- Food processing
- Geared motors
- Hoists*
- Lathes
- Medical equipment
- Milling machines
- Operating valves
- Paper cutting machines
- Rope making machinery
- Servo drives for aerials
- Shearing machines
- Sheet metal stamping machines
- Textile machines
- Veneer cutters
- Winches*
- Wire drawing machines
- Wood working machines

*Brakes for escalator and hoist applications: refer to your local sales office.

THE BRAKE

The DC spring applied fail-safe disc brake is a well established and proven product, which conforms with all the known safety standards. The motor and brake unit are Canadian Standard Authority (CSA) approved.

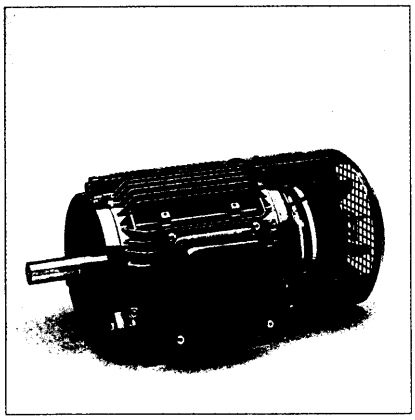
In construction the stator/armature assembly consists of a stator body enclosing the coil, compression springs and tappets, a torque adjustment ring and an armature plate.

The rotor is manufactured from non-magnetic materials, having a very low inertia, with friction material bonded to both sides. Internal, gear profile teeth, engage teeth cut on the hub, which is keyed onto the motor shaft, thus allowing free axial movement of the rotor.

When current flows through the coil, the armature plate is attracted to the coil body, releasing the brake rotor which is then free to rotate.

In the unenergised state, i.e. without current applied to the brake coil, the compression springs press the armature plate against the brake rotor, which in turn is pressed against the mounting flange.

Therefore, if there is a failure of supply to the motor, when the brake supply is taken from the same circuit, the brake will be applied: an important factor where safety of personnel and equipment is concerned. This is commonly known as a fail-safe or spring applied brake. The brake torque may be adjusted using a 'C' spanner on the adjuster ring, each 'click' giving an adjustment of torque, details available from your local sales office.



DA100LA Foot mounted brake motor

BRAKE SUPPLY VOLTAGE

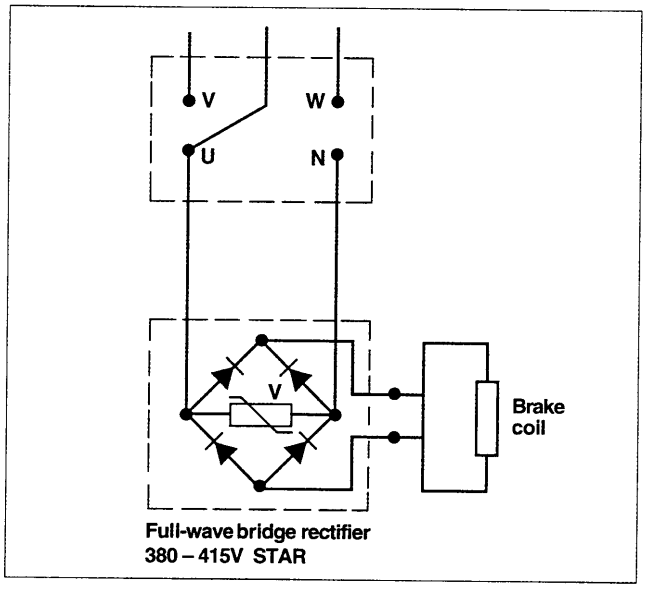
Standard brake units are suitable for operation on the following three-phase, 50 Hz supplies:

Up to and including 4kW:
220-240/380-415V
Above 4kW: 380–415V
Refer to sales office for voltages above 415V. Other supply conditions up to 660V can be catered for if required.

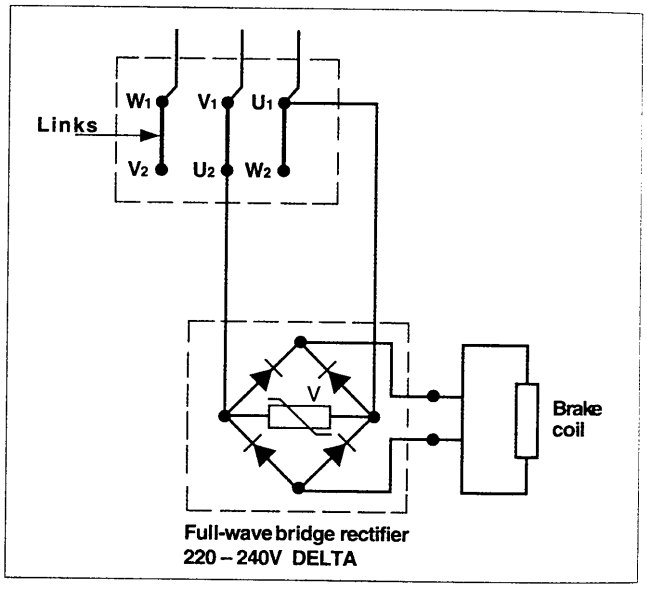
BRAKE MOTORS

STANDARD BRAKE CONNECTIONS

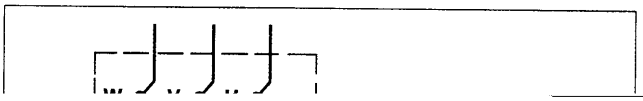
Brake motors dispatched by Electrodrives will have the brake rectifier already connected. On dual voltage machines connections will be made for the high voltage condition. As an option, where faster operation is required, additional terminals can be provided allowing the brake to be switched on the DC side by connection through auxiliary contacts on the starter. The brake can also be operated from separate supplies, again with additional terminals in the terminal box.

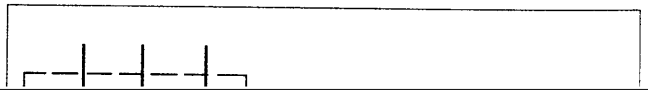


Full-wave bridge rectifier
380 – 415V STAR



Full-wave bridge rectifier
220 – 240V DELTA





The most suitable brake motor for a particular application is dependent upon a number of factors. Accordingly, the selection can be made by following the procedure outlined in sections 1 or 2 below, and then confirming that choice with the calculations in section 3.

1. STOP OR HOLD APPLICATIONS

Where a brake is required for holding purposes, or for providing a stop in approximately the same time as that required for the motor to accelerate the load, then a standard unit can be used.

The standard range of brake motors is fitted with brakes which have been selected to give a braking torque safely in excess of the motor rated torque.

2. STOPPING HIGH INTERTIA LOADS IN NORMAL AMBIENT TEMPERATURE

(For high temperature applications refer to sales office). For stopping applications where a flywheel effect is present and the inertia of the load has to be taken into account, the following procedure should be applied:

i) The torque required to decelerate the braked load is:

$$Tdec = \frac{I \times min^{-1}}{9.55 \times t} (Nm)$$

Where I=load inertia (kg m²) referred to motor speed and

t=stopping time (seconds)

ii) If the load is assisting or hindering the brake (e.g. a hoist travelling down hinders the brake, but the load of a lathe mechanism assists the brake), then this should be accounted for as follows:

Brake torque $TB=Tdec-Tload$ (load assists) (Nm)

or brake torque $TB=Tdec+Tload$ (load hinders) (Nm)

where: $Tload$=dynamic torque due to load (Nm)

TB=brake torque (Nm)

The brake selection based on torque can now be made from Table 22.

3. CHECKING 'WORK DONE'

i) Having made the initial selection from 1 or 2 a check should be carried out to see that the thermal parameters are not exceeded. If the load assists the brake then the work done in stopping an inertia I (kg m²) is given by:

$$W = \frac{I \times min^{-1}}{182.5} \times \frac{TB}{TB+Tload} (Joules)$$

If the load hinders the brake, then the work done in stopping an inertia I is given by:

$$W = \frac{I \times min^{-1}}{182.5} \times \frac{TB}{TB-Tload} (Joules)$$

In many cases $Tload$ can be so small as to be ignored. In this case use:

$$W = \frac{I \times min^{-1}}{182.5} (Joules)$$

This value for work done in a stopping operation should not exceed the value for 'Max. friction work per operation' given in Table 22.

ii) Operating frequency

For continuously rated (S1 duty) output, standard motors can withstand 4 starts-stops per hour under rated conditions with the motor at normal running temperature.

Note: More frequent starting-stopping duties may involve derating of machine - refer the details to your local sales office.

iii) Life

The life of the brake linings, before adjustment is required = $\frac{Wadj}{W}$

$Wadj$ is shown in Table 22.

The total life will depend on the number of adjustments possible.

DIMENSIONS

Brake motors increase in length and weight, compared to standard motors. Dimension 'L' and the mass shown on pages 34 to 36 will be affected as detailed in table 23:

TABLE 23

Frame Size	Increase in Length 'L1' mm*	Increase In Weight kg
DA63	58.0	1.0
DA71	58.0	1.0
DA80	60.0	1.8
DA90S	76.0	4.5
DA90L	76.0	4.8
DA100L	79.0	5.3
DA112M	79.0	5.3
DA132S	95.0	11.7
DA132M	95.0	1.7
DA160M	110.0	20.7
DA180M	110.0	20.7
DA180L	110.0	21.0

* Add 'L' to L1 to calculate overall length.

TABLE 22: TECHNICAL DATA

Brake size	06	08	10	12	14	16	18	20	25
Torque (Nm)	4	8	16	32	60	80	150	240	360
Power dissipation, P_R(W)	66	100	133	200	233	266	333	416	500
Max. friction work per operation, W(J)	$3x10^3$	$6x10^3$	$12x10^3$	$24x10^3$	$30x10^3$	$36x10^3$	$60x10^3$	$80x10^3$	$120x10^3$
Total friction work before adjustment is required, W_{adj} (J)	$3.6x10^7$	$7x10^7$	$13x10^7$	$35x10^7$	$57x10^7$	$90x10^7$	$95x10^7$	$185x10^7$	$295x10^7$
Torque change per step of adjustment nut (Nm)	0.1	0.2	0.6	1.2	1.6	2.1	1.4	2.0	5*

* For 45° angle of adjuster nut.

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SLIDE RAILS

Slide rails are available for all Alpak II **DIRECT DRIVES** **LOCATION OF**

MARINE MOTORS

Alpak II motors can be supplied to the requirements of most major Marine specifications. Table 25 lists the main requirements.

TABLE 25: MARINE MOTOR SPECIFICATIONS

Classifying Authority	Service	Ambient Temperature °C	Temperature Rise °C	Key Special Requirements
Lloyds Register of Shipping	Restricted	40	75 or 90	None
	Unrestricted	45	70 or 90	
Det Norske Veritas[1] (DNV)	Restricted	35[2]	80 or100	None
	Unrestricted	45	70 or 90	
Germanischer Lloyd	Restricted	40	80 or 100	None
	Unrestricted	45	75 or 95	
American Bureau of Shipping (ABS)	Non-Essential	40	80 or 105	Documentation for approval for witnessed test motors
	Essential	50	70 or 95	
Korean Register of Shipping	Essential and Non-essential	50	70 or 90	Witnessed test required for all essential service
Bureau Veritas	Auxiliaries	45	75 or 95	Tests required on all essential service
		40	80 or 100	
	Essential	50	70 or 90	
Nippon Kaiji Kyokai (NKK)		45	75 or 95	+5°C rise allowed on non-ventilated, totally enclosed motors

[1] Blanket type approval; [2] Refrigerated holds.

OTHER RANGES

Single phase motors

Synchronous motors

Stator/rotor units

EDS1005 Admiralty approved motors

ORDERING YOUR ALPAK II MOTOR

Contact your local sales office (see back cover) or official Electrodrives distributor/stockist. Specify:-

1. Alpak II motor
2. kW output
3. min^{-1}
4. Mounting
5. Voltage and frequency
6. Application as required

CONTROL GEAR

We recommend Brook Crompton Control Gear for our complete range of electric motors. For details contact:-

Brook Crompton Controls
Monckton Road
Wakefield
West Yorkshire
UK WF2 7AL
Tel: +44(0)1924 368251
Fax: +44(0)1924 367274

GEAR UNITS

For drives requiring geared motors or gear units, Brook Hansen can offer units from 85Nm to 16,000Nm. For details contact your local sales office.

POLICY

Every care has been taken to ensure the accuracy of the information contained in this publication, but, due to a policy of continuous development and improvement the right is reserved to supply products which differ slightly from those illustrated and described in this publication.

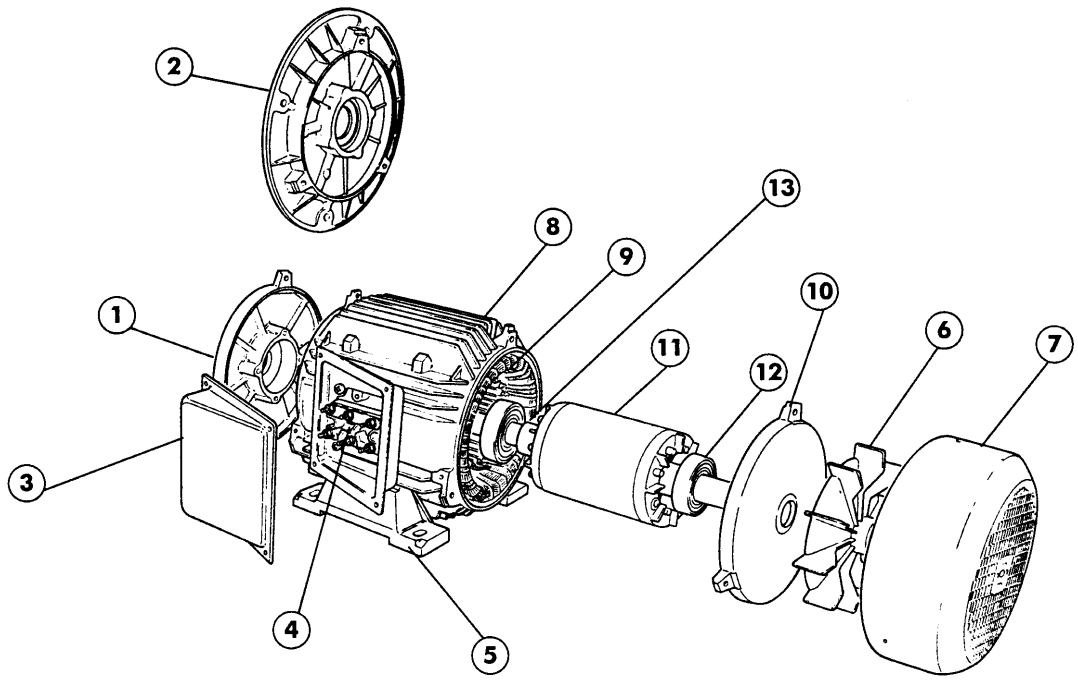
OPTIONAL FEATURES AND DESIGNS

Feature	Availability
BALANCE	
Reduced grade Z	O
Special grade X	O
BEARINGS	
Roller bearings	E
Locked for transport	E
Angular contact	O
Grease nipples	O[2]
DRAIN HOLES	
63-250	S
Screwed plugs	O
Position change	E
DIMENSION DRAWING	
Certified drawing	O
EARTH TERMINAL	
Internal	S
External	O
ENCLOSURE	

Feature	Availability
INSULATION	
Class F	S
Class H	O
NAMEPLATE	
Anodised Aluminium	S
Inverter rating	O[1]
DTR	O[1]
Class F output	SS
Customer nameplate	O
Direction of rotation	SS
MOUNTING ARRANGEMENTS	
B3 (foot) to B5 (flange)	SS
B3 (foot) to B35 (foot and flange)	SS[4]
B3 (foot) to B14 (face)	SS[3]
B3 (foot) to B34 (face and foot)	SS[3]
PAINT	
Alternative colour	O
Special	E

Feature	Availability
Cable entries undrilled	S
IP65	SS
Oversize	O
Loose leads	O
ELECTRICAL	
Multi-speed	O
Non standard voltage	O
Special Performance characteristics	O

ALPAK II THREE PHASE MOTOR

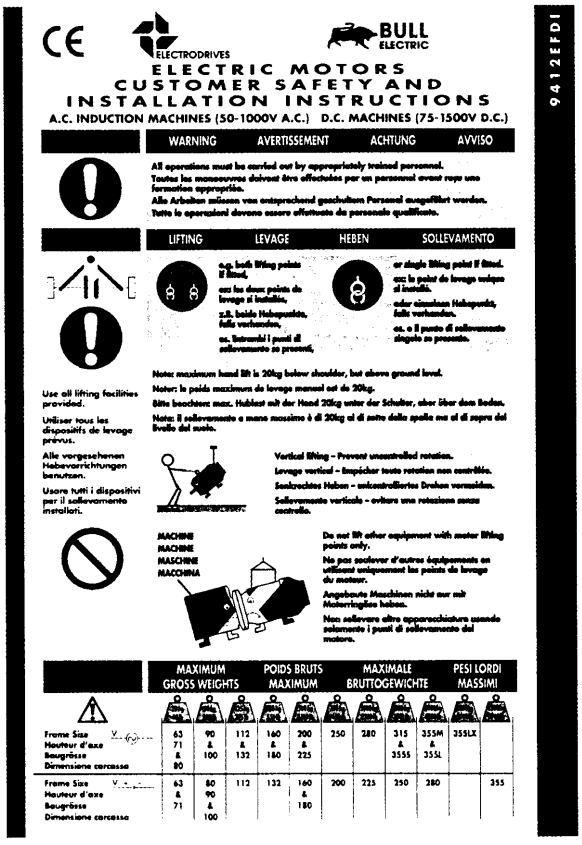


PARTS LIST

1. Endshield, drive end
2. Flange
3. Terminal box lid
4. Terminal board
5. Foot: supplied in sets
6. Fan
7. Fan cover
8. Stator Frame
9. Wound stator core
10. Endshield, non-drive end
11. Rotor assembly
12. Bearing, non-drive end
13. Bearing, drive end

WARNING

All motors are supplied with safety and installation instructions. These should be read carefully immediately on receipt of the motor. It should be passed on with the motor to the end-user.


CE
ELECTRODRIVES
BULL ELECTRIC
ELECTRIC MOTORS
CUSTOMER SAFETY AND INSTALLATION INSTRUCTIONS
A.C. INDUCTION MACHINES (50-1000V A.C.) D.C. MACHINES (75-1500V D.C.)
WARNING AVERTISSEMENT ACHTUNG AVVISO
LIFTING LEVAGE HEBEN SOLLEVAMENTO
MAXIMUM GROSS WEIGHTS POIDS BRUTS MAXIMUM MAXIMALE BRUTTOGEWICHTE PESI LORDI MASSIMI
9412EFDI

SPARE PARTS, INSTALLATION AND MAINTENANCE

INSTALLATION

Location

Motors must be installed with adequate access for routine maintenance. A minimum of 0.75m of working space around the motor is recommended. Adequate space around the motor, particularly at the fan inlet (50mm), is also necessary to facilitate airflow.

Where several motors are installed in close proximity, care must be taken to ensure that there is no recirculation of exhausted warm air. Foundations must be solid, rigid and level.

SHAFT FITMENTS

When fitting pulleys and half couplings, first check that bores and keyways are within their correct tolerances (see page 37) and are free from burrs.

TABLE 26: MOUNTING BOLTS

Frame Size	Foot Mounting Bolt Size*	Flange Mounting Bolt Size*	Face Mounting	
			Bolt Size†	Hole Depth
DA63	M6	M8	M5	8.0
DA71	M6	M8	M6	8.0
DA80	M8	M10	M6	9.0
DA90S	M8	M10	M8	12.0
DA90L	M8	M10	M8	12.0
DA100L	M10	M12	M8	12.0
DA112M	M10	M12	M8	12.0
DA132S	M10	M12	M10	12.0
DA132M	M10	M12	M10	15.0
DA160M	M12	M16	M12	19.0
DA160L	M12	M16	M12	19.0
DA180M	M12	M16	-	-
DA180L	M12	M16	-	-
DA200L	M16	M16	-	-
DA22S	M16	M16	-	-
DA225M	M16	M16	-	-
DA250S	M20	M16	-	-

† Motor face endshields have tapped holes to the sizes quoted in this column

* Bolts with any thread form or equivalent size may be used.

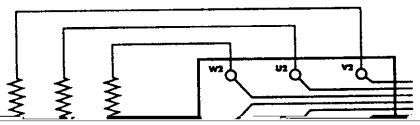
SPARE PARTS, INSTALLATION AND MAINTENANCE

LUBRICATION

Bearings are packed with sufficient grease for at least two years continuous operation without attention under normal conditions. The recommended grease is Esso Unirex N3 or other maker's equivalent.

[redacted]

condition is reduced to 1/3 current (or kVA compared to the direct-on-line condition). For the same motor, torques are also reduced to 1/3 direct-on-line values.



Similarly, Star/Delta starting or direct-on-line delta connections can be supplied as a special feature on motors up to and including 4kW, at certain specific voltages. Details available from your local sales office.

Series/Parallel or part-winding start connections can also be supplied. Details available from your local sales office.

[redacted]

[redacted] 27 is adequate under normal

PERFORMANCE DATA (2 pole) 3000 min⁻¹

DATI RELATIVI ALLE CARATTERISTICHE (2 poli) 3000 giri min⁻¹

P_N kW	n min⁻¹	Typ.	I_N 380V A	I_N 400V A	I_N 415V A	η 1.0P_N 0.75P_N 0.5P_N	Cos Ø 1.0P_N 0.75P_N 0.5P_N	M_N Nm	$\frac{I_A}{I_N}$	$\frac{M_A}{M_N}$	$\frac{M_K}{M_N}$	$\frac{M_S}{M_N}$	J kgm²	Rotor Mass kg / Peso rotore kg	L_{PA} dB(A)
0.25	2840	DA63MA	0.67	0.67	0.67	**66.0** 65.0 59.0	**0.82** 0.76 0.62	0.84	4.00	2.00	2.50	1.40	0.000363	0.96	58
0.37	2890	DA71MA	0.92	0.92	0.92	**75.0** 74.0 68.0	**0.78** 0.70 0.57	1.22	5.50	2.00	2.50	1.40	0.000533	1.42	58
0.55	2810	DA71MA	1.27	1.22	1.22	**73.5** 74.5 70.5	**0.89** 0.82 0.68	1.87	5.00	1.70	2.20	1.20	0.000533	1.42	58
0.75	2800	DA80MA	1.81	1.72	1.70	**74.5** 75.0 73.5	**0.85** 0.79 0.69	2.56	5.25	2.40	3.00	1.70	0.000980	1.96	62
1.1	2800	DA80MB	2.55	2.43	2.43	**77.0** 77.0 74.5	**0.85** 0.79 0.68	3.75	5.75	2.60	3.00	1.80	0.001140	2.30	62
1.5	2800	DA90SA	3.2	3.1	3.0	**79.5** 80.0 79.0	**0.89** 0.85 0.76	5.12	6.00	2.50	2.80	1.75	0.001610	3.04	65
2.2	2800	DA90LA	4.8	4.6	4.5	**80.5** 81.0 78.5	**0.86** 0.81 0.70	7.5	6.25	2.60	3.00	1.80	0.001990	3.29	65
3	2830	DA100LA	5.85	5.65	5.6	**85.0** 86.0 85.0	**0.90** 0.86 0.76	10.1	7.00	2.60	3.30	1.80	0.006430	6.08	62
4	2830	DA112MA	7.6	7.25	7.1	**86.5** 87.5 87.5	**0.92** 0.90 0.83	13.5	7.50	2.80	3.30	1.95	0.007350	7.0	65
5.5	2870	DA132SA	10.8	10.5	10.3	**86.5** 86.5 85.0	**0.88** 0.85 0.77	18.3	6.50	2.20	2.40	1.50	0.0165	7.8	71
7.5	2870	DA132SB	14.4	13.8	13.6	**88.0** 88.0 86.5	**0.89** 0.86 0.79	25.0	7.00	2.50	2.80	1.75	0.0190	12.4	71
11	2900	DA160MA	21.5	20.8	20.7	**88.0** 87.5 85.5	**0.87** 0.83 0.76	36.2	6.25	2.30	2.60	1.60	0.0380	17.5	74
15	2900	DA160MB	28.2	27.5	27.3	**89.5** 89.0 87.5	**0.88** 0.85 0.78	49.4	6.75	2.50	2.90	1.75	0.0463	20.9	74
18.5	2910	DA160LA	34.5	33.0	32.4	**91.0** 90.5 89.0	**0.89** 0.85 0.77	60.7	8.00	2.70	3.10	1.90	0.0600	24.0	74
22	2920	DA180MA	40.5	39.5	39.5	**91.5** 91.0 89.5	**0.88** 0.84 0.76	72.0	8.00	2.70	3.10	1.90	0.0630	25.0	74
30	2940	DA200LA	62.0	59.5	58.0	**90.0** 89.5 87.0	**0.81** 0.79 0.72	97.4	5.50	2.00	2.40	1.40	0.1710	46.0	83
37	2940	DA200LB	71.0	68.0	66.5	**91.5** 90.5 88.0	**0.86** 0.84 0.78	120	6.00	2.00	2.40	1.40	0.1980	54.0	83
45	2940	DA225MA	86	82	80	**92.0** 91.0 89.0	**0.86** 0.85 0.80	146	6.00	2.00	2.40	1.40	0.2150	61.0	83
55	2950	DA250SA	105	101	99	**92.5** 92.0 90.0	**0.85** 0.83 0.78	178	6.50	2.50	2.50	1.75	0.250	69.0	83

For notes see fold out flap on page I42.
Per note vedere il risvolto a pagina I42.

(4 pole)
(4 poli)

1500 min⁻¹
1500 giri min⁻¹

P_N kW	n min⁻¹	Typ.	I_N 380V	I_N 400V	I_N 415V	η 1.0P_N 0.75P_N	Cos Ø 1.0P_N 0.75P_N	M_N Nm	$\frac{I_A}{I_N}$	$\frac{M_A}{M_N}$	$\frac{M_K}{M_N}$	$\frac{M_S}{M_N}$	J kgm²	Rotor Mass kg Peso	L_{PA} dB(A)

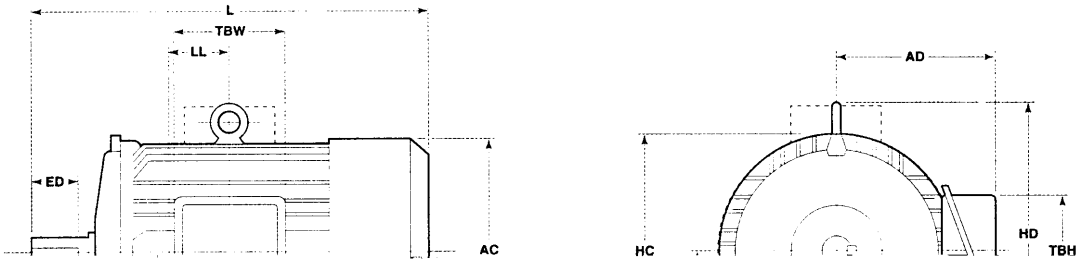
DATI RELATIVI ALLE CARATTERISTICHE (6 poli) 1000 giri min⁻¹

P_N kW	n min⁻¹	Typ.	I_N 380V A	I_N 400V A	I_N 415V A	η 1.0P_N 0.75P_N 0.5P_N	Cos Ø 1.0P_N 0.75P_N 0.5P_N	M_N Nm	$\frac{I_A}{I_N}$	$\frac{M_A}{M_N}$	$\frac{M_K}{M_N}$	$\frac{M_S}{M_N}$	J kgm²	Rotor Mass kg Peso rotore kg	L_{PA} dB(A)
0.37	910	DA80MA	1.13	1.12	1.12	**70.5** 70.0 65.0	**0.68** 0.59 0.47	3.88	4.00	2.30	2.60	1.60	0.001610	2.66	50
0.55	910	DA80MA	1.74	1.74	1.74	**69.5** 68.0 62.5	**0.66** 0.56 0.45	5.77	4.00	2.30	2.60	1.60	0.001610	2.66	50
0.75	920	DA90SA	2.2	2.2	2.2	**74.5** 73.5 69.5	**0.66** 0.56 0.45	7.8	5.00	2.40	2.60	1.70	0.003400	4.03	55
1.1	920	DA90LA	3.2	3.2	3.2	**76.0** 75.0 70.5	**0.66** 0.57 0.44	11.4	5.00	2.40	2.60	1.70	0.003880	4.60	55
1.5	950	DA100LA	3.5	3.45	3.45	**81.5** 82.5 81.0	**0.77** 0.69 0.55	15.1	6.00	2.00	2.90	1.40	0.01160	8.54	58
2.2	950	DA112MA	5.3	5.2	5.2	**82.5** 82.5 81.0	**0.74** 0.66 0.52	22.1	6.30	2.30	3.00	1.60	0.01380	10.0	58
3	960	DA132SA	6.8	6.7	6.7	**86.0** 86.0 85.0	**0.76** 0.68 0.56	29.8	6.50	2.00	2.70	1.40	0.03350	15.3	58
4	960	DA132MA	8.7	8.6	8.6	**86.5** 86.5 85.5	**0.78** 0.70 0.59	39.8	6.60	1.90	2.80	1.35	0.03550	17.0	58
5.5	960	DA132MB	11.8	11.6	11.6	**87.5** 87.5 86.5	**0.78** 0.71 0.58	54.7	6.90	1.90	3.00	1.35	0.04150	18.6	58
7.5	960	DA160MA	16.6	16.5	16.5	**86.5** 86.0 83.0	**0.76** 0.68 0.56	74.6	6.00	2.00	2.30	1.40	0.0920	24.9	62
11	960	DA160LA	23.7	23.6	23.6	**87.5** 87.5 85.0	**0.77** 0.72 0.61	109	5.50	2.00	2.30	1.40	0.1140	32.1	62
15	960	DA180LA	31.5	30.5	30.5	**89.0** 89.0 87.0	**0.80** 0.73 0.62	149	5.50	2.00	2.30	1.40	0.1460	45.9	63
18.5	970	DA200LA	38.0	37.0	37.0	**90.0** 89.0 86.5	**0.80** 0.74 0.64	182	6.00	2.30	2.60	1.60	0.3590	65.2	66
22	970	DA200LB	49.0	49.0	49.0	**89.0** 88.0 85.0	**0.73** 0.66 0.55	217	6.00	2.30	2.60	1.60	0.3590	65.2	68
30	970	DA225MA	60.0	58.5	58.0	**91.5** 91.0 89.5	**0.81** 0.78 0.69	295	6.50	2.40	2.40	1.70	0.4710	87.0	68
37	975	DA250SA	74.5	73.0	73.0	**92.0** 91.5 90.0	**0.80** 0.76 0.66	362	6.90	3.00	2.50	2.10	0.570	108.0	68

For notes see fold out flap on page 142.
Per note vedere il risvolto a pagina 142.

DIMENSIONI - MONTAGGIO CON PIEDI, FLANGIA, FLANGIA RIDOTTA

B3, B5, B3/B5, B14, B3/14



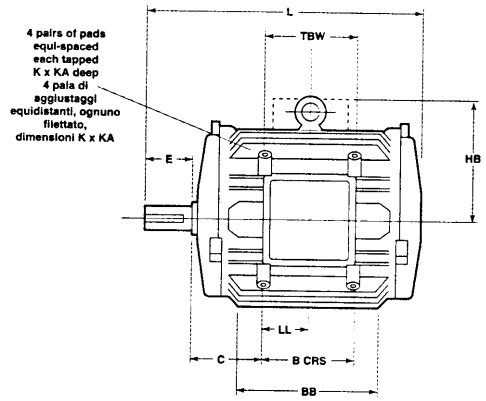
DIMENSIONS-FOOT, FLANGE AND FACE MOUNTING
DIMENSIONI - MONTAGGIO CON PIEDI, FLANGIA, FLANGIA RIDOTTA

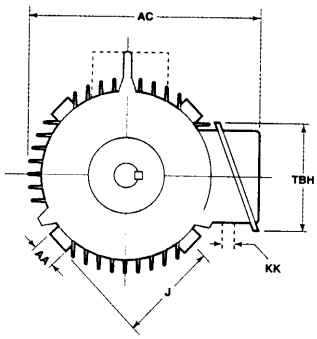
B3, B5, B3/B5, B14, B3/B14

Frame Size	Poles	General/Generale																				KK

DIMENSIONI CONTIRANTI

PAD/ROD CONTIRANTI





PAD/ROD MOUNTING MONTAGGIO CONTIRANTI

Frame Size / Grandezza carcassa	Poles / Poli	General / Generale														Shaft DE / Albero lato accoppiamento						
		B	C	AA	BB	J	K	KA	L	AC	HB	TBH	TBW	LL	KK	D	E	F	G	GD	DH	EH
DA80M	2-6	90	55	30	120	85	M12	16	240	162	-	102	88	45	1x21	19	40	6	15.5	6	M6	16
DA90L	2-8	90	73.5	30	120	92	M12	16	260	184	-	125	130	32.5	2x21	24	50	8	20	2	M8	19
DA100L	2-8	100	83	30	130	110	M12	16	325	220	-	122	125	5	2x21	28	60	8	24	7	M10	22
DA112M	2-8	100	83	30	130	110	M12	16	325	220	-	122	130	50	2x21	28	60	8	24	7	M10	22
DA132M	4-8	140	108	32	172	132	M16	22	398	264	170	150	154	51	2x26	38	80	10	33	8	M12	28
DA160L	2-8	200	135	40	240	160	M20	30	534	320	206	150	154	78	2x40	42	110	12	37	8	M16	36

APPROXIMATE SHIPPING SPECIFICATIONS
CARATTERISTICHE DI SPEDIZIONE APPROSSIMATIVE

Frame Size / Grandezza carcassa	Poles / Poli	B3 & B5 MOUNTING MONTAGGIO B3 E B5			B14 MOUNTING MONTAGGIO B14			PAD/ROD MOUNTING MONTAGGIO CONTIRANTI		
		Mass (kg)** Nett / Peso (kg)** Netto	Gross / Lordo	Capacity of Case (m³) / Volume involucro	Mass (kg)** Nett / Massa (kg)** Netto	Gross / Lordo	Capacity of Case (m³) / Volume involucro	Mass (kg)** Nett / Massa (kg)** Netto	Gross / Lordo	Capacity of Case (m³) / Volume involucro
DA63M	2&4	4.1	6.4	0.016	4.5	6.8	0.016	-	-	-
DA71M	2&4	5.7	8.2	0.017	6.2	8.7	0.017	-	-	-
DA80M	2-6	10.9	13.6	0.030	11.0	13.7	0.030	11.0	13.7	0.030
DA90S	2-8	13.5	16.2	0.030	14.0	16.7	0.030	-	-	-
DA90L	2-8	15.0	17.8	0.030	15.0	17.7	0.030	16.3	19.1	0.030
DA100L	2-8	25.4	28.6	0.054	23.0	26.2	0.054	25.4	28.6	0.540
DA112M	2-8	28.6	31.8	0.054						

PULLEYS AND COUPLINGS
PULEGGE E GIUNTI

Frame Size / Grandezza carcassa	Poles / Poli	Recommended Bore of Pulley or Coupling / Fori raccomandati per puleggia o giunto							
		Coupling Bore / Foro giunto		Pulley Bore / Foro puleggia		Keyway Width / Larghezza cava chiavetta		Keyseat Depth / Profondità sede di chiavetta	
		Bore / Foro	Tol(H7) / Toll	Bore / Foro	Tol(F7) / Toll	Nom	Tol(Js9) / Toll	Nom	Tol
DA63	2 & 4	10.977	+0.018	11.000	+0.018	3.985	+0.030	12.8	+0.1
DA71	2 & 4	13.977	+0.018	14.000	+0.018	4.985	+0.030	16.3	+0.1
DA80	2-6	18.977	+0.021	19.000	+0.021	5.985	+0.030	21.8	+0.1
DA90S	2-8	23.977	+0.021	24.000	+0.021	7.982	+0.036	27.3	+0.2
DA90L	2-8	23.977	+0.021	24.000	+0.021	7.982	+0.036	27.3	+0.2
DA100L	2-8	27.977	+0.021	28.000	+0.021	7.982	+0.036	31.3	+0.2
DA112M	2-8	27.977	+0.021	28.000	+0.021	7.982	+0.036	31.3	+0.2
DA132S	2-8	37.977	+0.025	38.000	+0.025	9.982	+0.036	41.3	+0.2
DA132M	4-8	37.977	+0.025	38.000	+0.025	9.982	+0.036	41.3	+0.2
DA160M	2-8	41.977	+0.025	42.000	+0.025	11.979	+0.042	45.3	+0.2
DA160L	2-8	41.977	+0.025	42.000	+0.025	11.979	+0.042	45.3	+0.2
DA180M	2 & 4	47.977	+0.025	48.000	+0.025	13.979	+0.042	51.8	+0.2
DA180L	4-8	47.977	+0.025	48.000	+0.025	13.979	+0.042	51.8	+0.2
DA200L	2	54.975	+0.030	55.000	+0.030	15.979	+0.042	59.3	+0.2
DA200L	4-8	54.975	+0.030	55.000	+0.030	15.979	+0.042	59.3	+0.2
DA225S	4 & 8	59.975	+0.030	60.000	+0.030	17.979	+0.042	64.4	+0.2
DA225M	2	54.975	+0.030	60.000	+0.030	17.979	+0.042	64.4	+0.2
DA225M	4 & 8	59.975	+0.030	60.000	+0.030	17.979	+0.042	64.4	+0.2
DA250S	2*	59.977	+0.030	-	-	17.979	+0.043	64.4	+0.2
DA250S	4-8	69.977	+0.030	70.020	+0.030	19.974	+0.052	74.9	+0.2

* Not suitable for Pulley Drives.

* Non adatto per trasmissione con puleggia

Notes

When using indirect drives such as belts, ropes and pinions to couple motors to their loads, there is a danger that excessive stress may be imposed on the motor shaft and bearings by the side loadings inherent in these methods of power transmission. It is advisable to consult your local Sales Office when such drives are being designed.

A full range of pulleys and couplings is available from our sister company Brook Hansen Transmissions (UK), Nile Street, Huddersfield, HD1 3LW, UK.

Tel: +44 (0) 1484 431414

Fax: +44 (0) 1484 431426

Note

Quando si usano accoppiamenti a trasmissione come cinghie, corde o pignoni per accoppiare i motori alle macchine condotte, vi è il pericolo di esercitare eccessiva sollecitazione sull'albero e sui cuscinetti del motore a causa di carichi radiali relativi. Si consiglia di rivolgersi al proprio ufficio vendite locale quando vengono richieste queste condizioni di accoppiamento.

Una gamma completa di pulegge e giunti è disponibile dalla nostra consociata Brook Hansen Transmissions (UK), Nile Street, Huddersfield, HD1 3LW, UK

Tel: +44 (0) 1484 431414

Fax: +44 (0) 1484 431426

PERFORMANCE DATA NOTES:

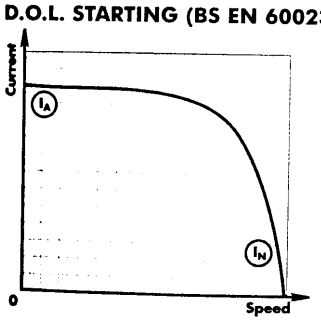
For use with pages 30-33

KEY

Symbol	Comments		Additional Info	Unit	Tolerances
P_N	Rated Power			kW hp	
n	Full load speed in revolutions per minute		min^{-1}		
Typ.	Frame reference and size				
I_N	Full load current at rated voltage		380V 400V 415V	A	
η	Efficiency	Full load	1.0 P_N	%	(Calculated by summation of losses) –0.15 $(100 - \eta)$% when $P_N \leq 50kW$ or –0.1 $(100 - \eta)$% when $P_N > 50kW$
		3/4 load	0.75 P_N		
		1/2 load	0.5 P_N		
CosØ	Power Factor	Full load	1.0 P_N		
		3/4 load	0.75 P_N		
		1/2 load	0.5 P_N		
M_N	Full load torque			Nm	
I_A/I_N	Direct on line starting current ratio				
M_A/M_N	Direct on line starting torque ratio				–15% +25%
M_K/M_N	Direct on line pull out torque ratio				
M_S/M_N	Direct on line pull up ratio				–15%
J	Rotor inertia WK^2			kgm^2	
L_{PA}	Mean sound pressure level @ 1m on no load			dB(A)	+3 dB(A)
Slip	(Synchronous speed – Full load speed) / Synchronous speed				

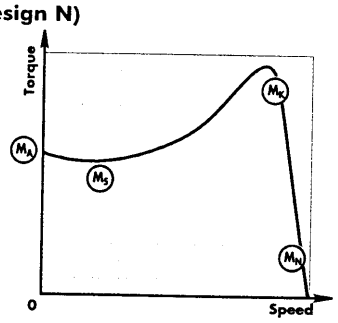
Notes: Performance tolerances are in accordance with IEC 34-1 (BS EN 60034-1). Where a tolerance is given in one direction only, there is no limit in the opposite direction.

D.O.L. STARTING (BS EN 60023-12 Design N)



Typical Speed/Current Curve
(I_A) Starting Current;
(I_N) Full Load Current.

Torque/Speed curves for specific motors can be supplied on request.



Typical Speed/Torque Curve
(M_A) Starting Torque or Locked Rotor Torque;
(M_S) Pull Up Torque or Run Up Torque;
(M_K) Pull Out Torque or Breakdown Torque;
(M_N) Full Load Torque.

Star/Delta starting is available on motors rated up to and including 4kW. Details available on request.

$J\ (WK^2 \text{ or } WR^2) = \frac{GD^2}{4}$ J in lb $ft^2 = \frac{kgm^2}{0.042}$

To calculate I_N on special voltages, multiply the I_N at 400 Volts by the following factors:

Voltages	220	346	365	420	440	500	550
Factor	1.82	1.16	1.1	0.95	0.91	0.8	0.73

DIMENSIONS NOTES:

For use with pages 34-37

SHAFT

Dim D	Tol.	Limits
11 to 18	j6	+0.008
		-0.003
19 to 28	j6	+0.009
		-0.004
32 to 48	k6	+0.018
		+0.002
55 to 70	m6	+0.030
		+0.011

FLANGE

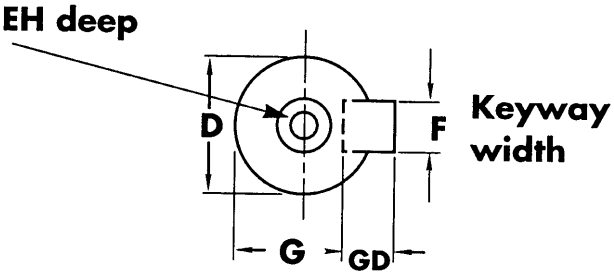
Dim N	Tol.	Limits
95 & 110	h8	+0.000
		-0.054
130 & 180	h8	+0.000
		-0.063
230 & 250	h8	+0.000
		-0.072
300	h8	+0.000
		-0.081
350	h8	+0.000
		-0.089
450	h8	+0.000
		-0.100

FACE

Dim N	Tol.	Limits
60 to 80	h8	+0.000
		-0.046
95 & 110	h8	+0.000
		-0.054
130 & 180	h8	+0.000
		-0.063

SHAFT EXTENSION AND COUPLING OR PULLEY DETAILS

Shaft tapped DH x EH deep



Notes

All dimensions in millimetres.

Cable entry can be arranged in any one of four positions at 90° intervals.

Dimensions should not be used for installation purposes unless specially endorsed.

Illustrations

Illustrations on pages 34 and 36 depict a DA132 frame, other frames may differ from these illustrations.

AB=Dimension across feet; AC=Frame diameter; AD=Dimension over terminal box from motor centre line; BB=Dimension along feet; D=Shaft diameter; E=Shaft length; H=Shaft centre height; HC/HD=Motor height; L=Overall length.

For full details of the British Standard dimension letters used, please refer to the drawings on pages 34 and 36.

Frame DA160 and above have 2 eyebolts.