



GS 112-4

Guidance for Specification GS 112-4
HIGH VOLTAGE INDUCTION MOTORS

October 1993

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BP GROUP RECOMMENDED PRACTICES AND SPECIFICATIONS FOR ENGINEERING											
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SCOPE AND PURPOSE This document gives specification guidance on all BP application and testing requirements for high voltage induction motors. Its purpose is for the specification of a fit-for-purpose system at minimum cost.											
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FOREWORD

Introduction to BP Group Recommended Practices and Specifications for Engineering

The Introductory volume contains a series of documents that provide an introduction to the BP Group Recommended Practices and Specifications for Engineering (RPSEs). In particular, the 'General Foreword' sets out the philosophy of the RPSEs. Other documents in the Introductory volume provide general guidance on using the RPSEs and background information to Engineering Standards in BP. There are also recommendations for specific definitions and requirements.

Value of this Guidance for Specification

This Guidance for Specification enables the application requirements for high voltage induction motors to be properly described by purchasers and for vendors to properly define the performance characteristics.

Application

This Guidance for Specification is intended to guide the purchaser in the use or creation of a fit-for-purpose specification for enquiry or purchasing activity.

Text in italics is Commentary. Commentary provides background information which supports the requirements of the Specification, and may discuss alternative options. It also gives guidance on the implementation of any 'Specification' or 'Approval' actions; specific actions are indicated by an asterisk (*) preceding a paragraph number.

This document may refer to certain local, national or international regulations but the responsibility to ensure compliance with legislation and any other statutory requirements lies with the user. The user should adapt or supplement this document to ensure compliance for the specific application.

Specification Ready for Application

A Specification (BP Spec 112-4) is available which may be suitable for enquiry or purchasing without modification. It is derived from this BP Group Guidance for Specification by retaining the technical body unaltered but omitting all commentary, omitting the data page and inserting a modified Foreword.

Principal Changes from Previous Edition

This Guidance for Specification is a revision of BP Std 220 which was first issued in 1983 and which was based upon the requirements of the 1981 issue of [OCMA Spec No. ELEC 1](#). This revision is based on [EEMUA Publication No. 132](#) which has superseded OCMA Spec No. ELEC 1.



Feedback and Further Information

Users are invited to feed back any comments and to detail experiences in the application of BP RPSE's, to assist in the process of their continuous improvement.

For feedback and further information, please contact Standards Group, or the Custodian. See Quarterly Status List for contacts.



1. SCOPE

This Specification gives requirements for induction motors suitable for operation on alternating current supplies at voltages in excess of 1 kV but not exceeding 15 kV. Normally the rating for such machines will be in excess of 150 kW.

This Specification covers normal classes of induction motors generally found in industry and includes machines which may be required for installation in areas classified as hazardous or non-hazardous.

The Standard does not cover in all respects motors for special applications such as downhole duties and totally submerged environments, or with special features such as hollow shafts.

The value of 150 kW as the break point between low voltage and high voltage machines is based upon economic considerations for motors taken in isolation. Overall system considerations must always be born in mind and on occasion it may be better to employ one voltage level and to consider the use of soft start techniques, at low voltage, for relatively large motors, and unit transformers, at high voltage, for relatively small motors.

Provided that decided advantage can be proven there is no objection to employing machines, suitable for use in one particular area classification, within a less onerous area (e.g. Type 'e' in either Zone 2 or non-hazardous areas).

2. GENERAL

2.1 Documentation

2.1.1 This Specification shall be read in conjunction with an enquiry or purchase order and all Data Sheets associated therewith.

2.1.2 The purchaser and vendor shall complete the Data Sheet.

2.2 Exceptions

2.2.1 Tenders for the supply of equipment against this Specification shall either include an unqualified affirmation regarding compliance with the Specification or a complete list of exceptions.

2.2.2 A vendor may offer alternative proposals for price or technical advantage if he wishes, but such proposals shall form a supplement to the main tender.

2.3 Conflicts

If any of the reference documents conflict and definition is not established by the provisions of Section 3 of this Specification then the



vendor shall bring this to the attention of BP and shall state the basis of design used.

2.4

Quality Assurance

Verification of the vendor's quality system is normally part of the pre-qualification procedure, and is therefore not specified in the core text of this specification. If this is not the case, clauses should be inserted to require the vendor to operate and be prepared to demonstrate the quality system to the purchaser. The quality system should ensure that the technical and QA requirements specified in the enquiry and purchase documents are applied to all materials, equipment and services provided by sub-contractors and to any free issue materials.

Further suggestions may be found in the BP Group RPSEs Introductory Volume.

3. STANDARD DESIGN REQUIREMENTS

3.1 General

- 3.1.1 All types of motor shall comply with all parts of [EEMUA Publication No. 132](#) (1988) except those parts which deal exclusively with machines for rated voltages below 1000 V.

Where EEMUA offers options the following applies:-

[EEMUA 3.1.1](#) Class F insulation, limited to Class B temperature rises, shall be employed unless otherwise specified on the Data Sheet.

The required rating of a motor for a particular piece of driven equipment is usually defined by the supplier of the driven equipment after taking into account any BP requirements. This rating takes account of any design uncertainty and manufacturing tolerances which may arise and therefore the motor should be suitable for all eventualities which may arise. Traditionally, the petrochemical industry has also 'built-in' a further safety margin for the motor by specifying Class B temperature rises (80°C) whilst employing Class F insulation materials (105°C rise), both pertaining whilst operating in a 40°C ambient air temperature or with 25°C cooling water. If operating conditions are such that the machine is unlikely to be overloaded and if the ambient conditions are well removed from standard then consideration should be given to specifying Class F rises for Class F materials, especially when significant weight or cost savings can be obtained.

[EEMUA 3.2.6](#) Normal surge protection is the standard unless otherwise specified on the Data Sheet.

[EEMUA 3.3.2](#) Winding temperature detectors shall be distributed at least 2 per phase.

[EEMUA 5.9](#) The manufacturer shall state the open circuit time constant for the motor and the percentage value of residual voltage (180 degrees anti-



phase) against which it may be connected to the supply, without detrimental effect to the motor.

In general high voltage machines are not suitable for reconnecting to a supply just after being switched off. This is because self excitation effects give rise to the generation of voltage for a short time after the machine is disconnected from the supply and this voltage is not in phase with the supply voltage. In the event of the supply being reconnected during this period very large torque's can be generated and these may cause damage. The vendor is required to provide data which enables the purchaser to arrange suitable controls and protection for the motor (and its driven equipment).

EEMUA 5.11 The motor shall be suitable for Normal starting duty unless otherwise specified on the Data Sheet.

EEMUA 11 Vibration levels shall be in accordance with the requirements given in 4.7

EEMUA Publication No. 132 has been selected as a base standard because it is a recognised industry standard for the users of induction motors, especially those in the petro-chemical industry.

3.1.2 All types of motor shall comply with the following parts of **BS 4999** unless such requirements conflict with the requirements of 4.1.1.

Part 101	Specification for rating and performance
Part 102	Methods for determining losses and efficiency from tests (excluding machines for traction vehicles).
Part 103	Specification for symbols
Part 105	Classification of degrees of protection provided by enclosures for rotating machines. The degree of protection shall be IP 55 unless otherwise specified on the Data Sheet.
Part 106	Classification of methods of cooling The cooling arrangement shall be IC 01 51 for air cooled machines and IC W37 A81 for water cooled machines unless otherwise specified on the Data Sheet. Air cooled machines shall not draw their air from the drive end of the machine.
Part 107	Specification for symbols for types of construction and mounting arrangements. Horizontally mounted machines shall be IM 1001 and vertical flange mounted machines shall

be IM 3011 in accordance with Code II unless otherwise specified on the Date Sheet.

Part 108	Specification for terminal markings and direction of rotation.
Part 112	Specification for starting performance of single speed three-phase induction motors
Part 141	Specification for standard dimensions.
Part 142	Specification for mechanical performance: vibration.
Part 143	Specification for tests
Part 144	Specification for the insulation of bars and coils of high voltage machines, including test methods.
Part 145	Specification for winding terminations

The requirements of EEMUA Publication No. 132 invoke BS 4999 and this document is also invoked in the further requirements of BP. It should be noted that BS 4999 is the UK equivalent of IEC 34, modified by relevant CENELEC Harmonisation Documents. It is therefore a suitable base document for use in all parts of the world in which the use of IEC and CENELEC documents are commended. It should be noted that differences between IEC 34, CENELEC requirements and individual national standards exist and that, as noted above, the BP requirements are based upon the British Standard requirement. Any requirement to meet other national interpretations of IEC 34, with or without CENELEC Harmonisation Document requirements applying, which do not match the requirements of BS 4999, must be identified and agreed in writing between the purchaser and the vendor. This procedure is intended to be the means by which particular local needs can be met whilst at the same time properly documenting deviations from the normal international BP requirements.

- 3.1.3 Harmonised versions of IEC 34 which are identical to or technically equivalent to those parts of BS 4999 referred to in 4.1.2 may be used as a reference document in place of BS 4999.

3.2 General Purpose Motors

- 3.2.1 General purpose (GP) motors shall comply with the requirements of BS 5000 Part 99.

In the absence of suitable industry or international standards BS 5000 is invoked for the particular types of machine described. This standard, in turn, largely invokes BS 4999 which, as already described, is largely compatible with the international requirements of IEC 34.



3.3 Type N Motors

3.3.1 Type N motors shall comply with the requirements of [BS 5000](#) Part 16.

See commentary for 3.2.1.

The maximum surface temperature shall be 200°C (Temperature Class T3) unless otherwise specified on the Data Sheet.

3.3.2 Type N motors shall be suitable for selection, installation and maintenance in accordance with [BS 5345](#) Parts 1 and 7.

3.3.3 The rating of Type N machines shall not exceed 11 kV.

3.3.4 Type N machines rated 3 kV and above shall include facilities for purging the machine with inert gas or compressed air before starting (following release of flammable gas or vapour).

Research work has indicated that electric motors can produce incendive discharges during starting.

Investigations show that corona discharges can occur on contaminated windings of high voltage machines. Should flammable gas or vapour be present in the machine at this time then an explosion could occur. This phenomena does not occur below 3 kV and the concept of non sparking machines remains valid at and below this voltage level. Therefore, certified Type N (and Type e) machines can be installed without further precautions when rated at 3 kV or less. Also, they can be installed at voltage levels up to 11 kV in zone 2 areas provided that precautions are taken to ensure that no flammable gasses or vapours are present in the machine during start up following a release. At this time it is not considered prudent either to install Type e machines rated above 3 kV in zone 1 or to install Type N or Type e machines in zone 2 areas when rated above 11 kV.

Additional work has shown another mechanism for incentive discharge production is airgap sparking, and that this phenomenon is related to rotor current density during run up rather than rated voltage. However, no further data is yet available regarding limitations in acceptable designs.

Results of further research have yet to become available, and other solutions to the problem of incendive discharges, which are not based on purging, are now being offered by manufacturers. Before selecting machines for applications it would be prudent to determine the latest recommendations from manufacturers and relevant specialists.

3.4 Flameproof (Type d) Motors

Opportunity is provided for purchasers to invoke international standard [IEC 79](#) or the equivalent European Standards. The preferred requirements for BP applications are the Euronorms (EN) because these are the standards normally met by vendors commonly supplying BP and against which certification by independent testing authorities has been obtained.



In the absence of an internationally agreed selection, installation and maintenance document, BS 5345 is invoked. This document is entirely compatible with BS 4999 and the EN 50 000 series of standards.

- 3.4.1 Flameproof (Type d) motors shall comply with the requirements of IEC 79-1, or EN 50 014 and EN 50 018, as specified on the Data Sheet.

The motor enclosure shall be classified Group IIB and the maximum surface temperature shall be 200°C (Temperature Class T3) unless otherwise specified on the Data Sheet.

- 3.4.2 Flameproof (Type d) motors shall be suitable for selection, installation and maintenance in accordance with the requirements of BS 5345 Parts 1 and 3.

3.5 Increased Safety (Type e) Motors

See commentary to 3.4.

- 3.5.1 Increased safety (Type e) motors shall comply with the requirements of IEC 79-7, or EN 50 014 and EN 50 019, as specified on the Data Sheet.

The maximum surface temperature shall be 200° C (Temperature Class T3) unless otherwise specified on the Data Sheet.

- 3.5.2 Increased Safety (Type e) motors shall be suitable for selection, installation and maintenance in accordance with the requirements of BS 5345 Parts 1 and 6.

- 3.5.3 The rating of Increased Safety (Type e) motors shall not exceed 3 kV when intended for use in Zone 1 applications.

See commentary to 3.3.4.

- 3.5.4 Increased Safety (Type e) motors which have a rating in excess of 3 kV and which are intended for Zone 2 application shall include facilities for purging the machine with inert gas or compressed air before starting (following flammable gas or vapour release).

See commentary to 3.3.4.

3.6 Pressurised (Type p) Motors

See commentary to 3.4.

- 3.6.1 Pressurised (Type p) motors shall comply with the requirements of IEC 79-2 or EN 50 014 and EN 50 016 as specified on the Data Sheet. The maximum surface temperature shall be 200°C (Temperature Class T3).

- 3.6.2 Pressurised (Type p) motors shall be suitable for selection, installation and maintenance in accordance with the requirement of BS 5345 Parts 1 and 5.

3.7 Certification for use in Hazardous Areas

- 3.7.1 All types of motor for use in Hazardous Areas classified either Zone 1 or Zone 2 shall have been appropriately certified by a National Certifying Authority.
- 3.7.2 Recognised National Certifying Authorities are identified in IEC 79-9. In the UK, the National Certifying Authorities are the EECS (Electrical Equipment Certification Service, formerly BASEEFA) and SIRA.
- 3.7.3 Copies of the relevant certification documents shall be submitted by the manufacturer with the tender.

4. SPECIAL DESIGN REQUIREMENTS

4.1 Duty and Rating

4.1.1 Continuous Operation

Motors shall be capable of meeting their specified duty for 26 000 hours (3 years) without being stopped for maintenance purposes.

4.2 Environmental Protection

- 4.2.1 All fixing bolts and the flanges of all flameproof (Type d) motors shall be coated with an approved grease during the course of assembly at the manufacturer's works.

Approved greases are those which the vendor has received permission to use by the relevant certifying authority.

- 4.2.2 All vertically mounted motors having a single shaft extension at the bottom shall be protected with a rain cowl (IP X2) supplied by the manufacturer.

- 4.2.3 Unless otherwise specified on the Data Sheet, anti-condensation heaters shall not be provided. Where heaters are provided, they shall be easily accessible without requiring dismantling of the motor.

The purpose of an anti-condensation heater is to preclude the possibility that the specified insulation level of the machine is seriously reduced by the entry of water or water vapour into the machine. Modern non-hygroscopic insulation materials



largely obviate the possibility of this occurring and manufacturers generally take good care to ensure that all conducting items are insulated to a high standard.

4.2.4 To prevent the ingress of water or other harmful matter prior to cabling, open cable entries shall be adequately sealed (IP 55) before the motor is despatched from the manufacturer's works.

4.2.5 Where a drain hole is provided, it shall be at the lowest point on the stator, subject to accessibility for the removal of the threaded plug when the machine is mounted in the service position. In the case of motors for use in hazardous areas, the drain hole shall be sealed with a draining device approved by the Certifying Authority.

Care must be exercised to ensure that the means of removing and replacing drain plugs are not impeded by the position in which the motor is mounted. This is not always the responsibility of the motor manufacturer but often the responsibility of a 'package' (e.g. pump set) vendor who provides the mounting (e.g. bedplate) for the motor.

4.3 Winding and Cable Terminations

4.3.1 Motor terminal boxes shall be of the pattern specified on the Data Sheet.

4.3.2 Motors, including the terminal box, windings and cable terminations shall be entirely suitable for operation at the fault level specified in the Data Sheet when started and protected by the means also specified in the Data Sheet.

4.3.3 Means shall be available for electrically isolating individual stator windings from each other and from the main incoming cables without involving extensive dismantling of the machine or risking damage to either the windings or the cables.

When specified on the Data Sheet, space shall be provided for the installation, at the manufacturers works, of current transformers to be supplied by the purchaser.

4.3.4 When a threaded entry is required for an auxiliary cable, as identified on the Data Sheet, a detachable plate or box, incorporating a threaded entry, shall be supplied. The minimum thickness of the material used for this purpose shall be 8 mm.

4.3.5 All threaded entries shall be tapped ISO metric to [BS 3643](#), Part 3, with a constant pitch of 1.5 mm and with medium fit tolerance class 6H. The size of thread required shall be as specified on the Data Sheet.



4.4 Bearings and Lubrication

- 4.4.1 All motors shall be capable of operating continuously whilst uncoupled from the driven equipment.

It is a common practice during commissioning and also during operational 'trouble shooting' to run motors disconnected from the driven machinery. All motors operated by BP should incorporate this facility and no special arrangements should be necessary in order to accomplish this.

- 4.4.2 Hydrodynamic radial bearings fitted to machines rated 2000 kW and above shall be equipped with resistance temperature detectors.

It is common practice to provide temperature sensing systems for complete drive 'packages' (i.e. driver and driven machinery). The provision of the overall system may not be by the motor vendor but he should provide the facilities for accommodating such a system. Provision of a complete temperature monitoring and protection system is outside the scope of this Specification but may be the subject of a related purchase Specification.

- 4.4.3 Vertical motor thrust bearings shall be equipped with resistance temperature detectors.

4.5 Balancing

- 4.5.1 If an overspeed test is required (Clause 6.2) then the rotor shall be check balanced after the overspeed test. If the residual out of balance has increased by more than 10% then the rotor shall be rebalanced and the overspeed test and the check balance repeated until the rotor is stable.

4.6 Critical Speeds

- 4.6.1 The manufacturer shall state the design value of the first critical speed on the Data Sheet.

- 4.6.2 The critical speeds of the rotor shall not be within 20% of any speed in the operating range nor within 20% of twice any speed in the operating range.

- 4.6.3 Critical speeds which lie below the operating speed shall be determined by run up and coast down of the machine during works test.

- 4.6.4 For all flexible rotor machines a rotor dynamic analysis shall be undertaken by the manufacturer and the results submitted to the purchaser. The analysis shall include evaluation of the damped critical speeds allowing for bearing oil film together with housing, end shield and bedplate stiffness effects.

4.7 Vibration

- 4.7.1 Two pole motors rated 1500 kW and above shall be fitted with dual non contacting vibration probes at each bearing all in accordance with [API 670](#).

In a manner similar to temperature monitoring either a complete ' package' vibration monitoring system may be required or a motor system alone may be required and will be separately specified. In either event motors shall be capable of accepting the necessary probes, either at the time of supply or later.

- 4.7.2 Four pole motors rated 3000 kW and above shall be fitted with vibration monitoring devices at each bearing. Non-contacting vibration probes, in accordance with [API 670](#), or accelerometers (rms velocity reading), in accordance with [API 678](#), are acceptable.

- 4.7.3 The vibration amplitude of motors fitted with non contact vibration monitoring equipment shall not exceed a peak to peak level (unfiltered) of 63 micrometers including mechanical and electrical run out. Total mechanical and electrical run out shall not exceed 13 micrometers.

The vibration limits for all motors not fitted with non contact vibration monitoring equipment shall meet the requirements of [BS 4999](#) Part 142 as follows:-

- (a) for a shaft height less than 400 mm, Table 1, Quality R
- (b) for a shaft height 400 mm or greater, Table 2, Column 1

If vibration probes are fitted to the motor and if the complete vibration monitoring system can be made available at the manufacturers works during works test then these shall be employed for vibration testing. Otherwise, the standard tests specified in [BS 4999](#) Part 142 shall be employed. It is not necessary that the vibration monitoring system be purchased by the motor manufacturer, it is acceptable that it be borrowed from others (e.g. the 'package' vendor).

- 4.7.4 The vibration levels for machines fitted with flexible rotors when passing through the first critical speed shall be within the following limits:-

- (c) Motors fitted with hydrodynamic bearings:-

The peak to peak amplitude shall be less than 75% of the nominal bearing clearance.

- (d) Motors fitted with rolling element bearings:-

Less than three times the limits given in 4.7.3

See commentary for 4.7.3.

4.8 Plant Identification

- 4.8.1 In addition to the motor rating plate, a separate motor plant equipment identification plate shall be attached to a non-removable part of the frame in a readily visible position. The plate shall be fabricated from stainless steel and the means by which it is attached to the frame shall allow for the plate to be removed and replaced by a similar plate.
- 4.8.2 The identification plate shall be engraved with the Plant Tag Number and the Works Identification Number (WIN) if made known to the manufacturer before despatch.

4.9 Mechanical Handling

- 4.9.1 Facilities shall be provided for the application of jacking screws in all three planes, and their location shall be identified on the motor general arrangement drawing.
- 4.9.2 Where it is intended to use spreader bars for lifting all or part of the machine, or where other special handling precautions are necessary, these requirements shall be identified on a suitable plate attached to the external surface of the motor.

4.10 Painting

Details of the manufacturers standard paint (or other type of finish) specification shall be submitted to the purchaser at the time of tender.

5. NOISE

5.1 Noise Emission

The manufacturer shall provide details of the noise emission from his equipment in octave bands. He shall also provide details of any narrow band noise emitted by his equipment that is noticeable to the ear, together with the octave band or bands in which it occurs.

5.2 Noise Reduction

Where the noise-limiting requirements of this Standard cannot be met without the provision of noise-reducing features, the levels with and without these features shall be stated in any proposal.



6. TESTS

6.1 Standard Tests

The following tests shall be undertaken irrespective of rating:-

- (a) 'Complete' tests in accordance with EEMUA Publication No. 132 Clause 12.3 for at least one motor of each group of identical motors. Any requirement for undertaking 'complete' tests on more than one motor will be indicated in the Data Sheet.
- (b) 'Abbreviated' tests in accordance with [EEMUA Publication No. 132 Clause 12.2](#) on all motors not subject to 'complete' tests.
- (c) For motors with flexible rotors any critical speed which lies below the operating speed range of the motor shall be determined by means of a run up and coast down test.

6.2 Overspeed Test

A motor overspeed test, all in accordance with the requirements given in [BS 4999 Part 101](#), shall be undertaken for any machine whose rating exceeds that given by the following formula:-

$$R > \frac{5 \times 10^6 \times p^{0.5}}{f^2}$$

where R = rating - kW
p = number of poles
f = highest operating frequency - Hz

The empirical formula quoted has been devised in order to describe those sizes of machine, which, in BP experience, require to be subjected to overspeed so that rotor stability can reasonably be assured and no untoward vibration difficulties will be encountered during service due to a change in rotor balance.

6.3 Heat Run

Heat run (temperature rise) tests shall be conducted with the machine operating at rated voltage, load and speed.

6.4 Vibration

Vibration measurement tests shall be conducted with the machine operating at rated voltage and speed and mounted in a manner which is reasonably representative of site mounting conditions.

Whilst BP deprecates the inability of any vendor to meet the specified test requirements it is appreciated that on occasion manufacturers may have good reason for not being able to meet the above mentioned tests. In this case purchasers must be assured that adequate testing will be arranged so that the capability of a motor to meet the specified duty will be properly demonstrated.

7. DOCUMENTATION

7.1 Data Sheet

Items marked 'X' on the Data Sheet need not be completed at the time of enquiry/tender. All items on the Data Sheet shall be completed at the time of order.

7.2 Coil Quality and Interturn Tests

At appropriate stages of tender and manufacture, copies of test certificates covering coil quality assurance procedures and coil interturn tests shall be forwarded to the purchaser by the manufacturer.

7.3 Winding Data

Subsequent to the order and prior to despatch from manufacturer's works, full winding details shall be forwarded to the purchaser by the manufacturer.

7.4 Test Documentation

This shall be provided to demonstrate compliance with Clause 7.1.

7.5 Equivalent Circuit Documentation

This data shall be provided by the manufacturer in accordance with the equivalent circuit tabulation given in Page 2 of the Data Sheet.

7.6 General Arrangement Drawing

The manufacturer shall include with his tender a general arrangement drawing of the machine, on which the following information shall be included as a minimum:-

- Overall dimensions
- Mounting dimensions
- Shaft dimensions
- Lifting arrangement
- Jacking points
- Weight (net and gross)
- Minimum clearance dimensions for maintenance
- Bearing type
- Cable entry position.



TO BE COMPLETED BY PURCHASER															
1	INSTALLATION SITE					23	MOUNTING (BS 4999 PART 107)			IM 1001	IM 3011				
2	PLANT TAG NUMBER					24	ENCLOSURE (BS 4999 PART 105)			IP55					
3	DRIVEN LOAD (EG PUMP)					25	APPARATUS GROUP EN 50 014			IIB					
4	DRIVEN LOAD INERTIA (GD ²)					26	TEMP. CLASS EN 50 014			T3					
5	DRIVEN LOAD STARTING CHARACTERISTIC			GRAPH ATTACHED		27	AREA CLASS'N (IEC 79 - 10)			ZONE 0		ZONE 1		ZONE 2	
6				DRIVE			DIRECT	VEE BELT	28	APPARATUS CLASS 'N			GP	TYPE N	TYPE D
7	COUPLING TYPE						GEAR BOX		BS 5000				BS 5000	IEC 79-1	IEC 79-7
8	RATING			V	H _z	KW	29	TERMINAL BOX TYPE							
9	SPEED (SYNCHRONOUS)					RPM	DUCTS/DEFLECTOR PLATES			YES		NO			
10	DUTY (BS 4999 PART 101)			S1			30	SURGE WITHSTAND			NORMAL		SPECIAL		
11	SERVICE CONDITIONS IF EXCEEDING BS 4999 PART 101			ALTITUDE			31	COLOUR (BS 4800)							
12				STARTING CHARACTERISTIC (BS 4999 PART 112)			TEMP.		32	CABLE TYPE			MAIN		
13	SYSTEM FAULT LEVEL						MVA/KA	S	CABLE RATING AND CONDUCTOR MATERIAL (COPPER OR ALUMINIUM)				HEATER		
14	SYSTEM NEUTRAL EARTHING			DIRECT	UNEARTHED	33	CABLE CONDUCTOR					MAIN		V	CU
15				STARTING METHOD & DEVICE						RESISTANCE		34	SIZE AND NUMBER OF CORES		
16	PROTECTION PROVIDED			EARTH FAULT	HRC FUSES	STALL	35	CABLE GLAND PATTERN & THREAD (BS 6121)			MAIN				
17				ROTATION FACING DRIVE END			CLOCK				ANTI CLOCK	36	FRAME EARTH		
18	INSULATION CLASS			F			37	MAX. NOISE LEVEL (OFF LOAD)			85 DB (A)				
19	MAX. TEMPERATURE RISE			80°C		°C	38	REMARKS			NONE		ATTACHED		
20	COOLING (BS 4999 PART 106)			IC 01 51			SIGNATURE								
21	WINDING TEMPERATURE DETECTORS			RES. THERMOMETERS						NAME (PRINT)					
22				HEATER REQUIRED			NO	YES	V				ORGANISATION		
REV	DATE	REMARKS			BY	APP.	DATE								

ITEMS MARKED



NEED NOT BE COMPLETED AT ENQUIRY STAGE

DATA SHEET (SHEET 1 OF 3)

HIGH VOLTAGE INDUCTION MOTOR



TO BE COMPLETED BY MANUFACTURER									
1	MANUFACTURER				27	METHOD OF MEETING SPECIAL SURGE WITHSTAND REQUIREMENT		(A) SPECIAL TESTING	
								(B) SURGE PROTECTION	
2	MANUFACTURERS TENDER REF.				28	RE LUBRICATION INTERVAL		HRS	
3	MANUFACTURERS WORKS O/NO				29	BASIS OF LUBRICATION			
4	FRAME SIZE					INTERVAL CALCULATION			
5	FULL LOAD CURRENT		A		30	MOTOR ROTOR INERTIA (GD ²)		KG M ²	
6	LOCKED ROTOR CURRENT		A		31	ACCELERATION TIME AGAINST		100% V	
7	FULL LOAD TORQUE		NM			LOAD DEFINED BY ITEMS 3,4 & 5 OF DATA SHEET 1		80% V	
8	LOCKED ROTOR TORQUE		NM		32	STALL TIME HOT/COLD		S	S
9	PULL UP TORQUE		NM	RPM		JOGGING FACTOR HOT/COLD			
10	PULL OUT TORQUE		NM		33	TE TIME (TYPE E ONLY)			
11	1ST CRITICAL	FULL LOAD SPEED	RPM		34	GENERAL ARRANGEMENT DRG NO			
12	TORQUE-SLIP CURVE ATTACHED		YES		35	O/C TIME CONSTANT		S	
13	STARTING POWER FACTOR				36	RESTART RESIDUAL VOLTAGE		%	
14	EFFICIENCY 1: 3/4 : 1/2 FL				37	APPARATUS CLASSIFICATION			
15	POWER FACTOR 1: 3/4 : 1/2 FL					STANDARD (EG EN 50 018)			
16	RATING CLASS (BS 4999 PT 101)				38	CERTIFYING AUTHORITY			
17	MACHINE REVERSIBLE		YES		39	CERTIFICATE NUMBER			
18	FAN BI-DIRECTIONAL		YES		40	CERTIFICATE DATE			
19	STATOR CONNECTION		STAR		41	COPY OF CERTIFICATE ATTACHED		YES	NO
20	NUMBER OF STATOR WINDING TERMINALS				42	NOISE LEVEL			
						WITH ACOUSTIC TREATMENT		DB (A)	
21	INSULATION CLASS		F			NO ACOUSTIC TREATMENT		DB (A)	
22	TEMPERATURE RISE		°C		43	MACHINE ASSEMBLED AT			
23	PERFORMANCE TYPE TEST								
	CERTIFICATE REFERENCE				44	SPECIFICATION MET IN FULL EXCEPT FOR CLAUSES LISTED		NONE	
24	COPY OF CERTIFICATE ATTACHED		YES	NO					
25	STATOR COIL QUALITY ASSURANCE SPECIFICATION		ES 1 44-5		45	REMARKS		NONE	ATTACHED
26	WINDING DATA ATTACHED		YES	NO					
	REFERENCE								
REV	DATE	REMARKS	BY	APP.	46	SIGNATURE			
						NAME (PRINT)			
						ORGANISATION			
						DATE			

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ITEMS MARKED

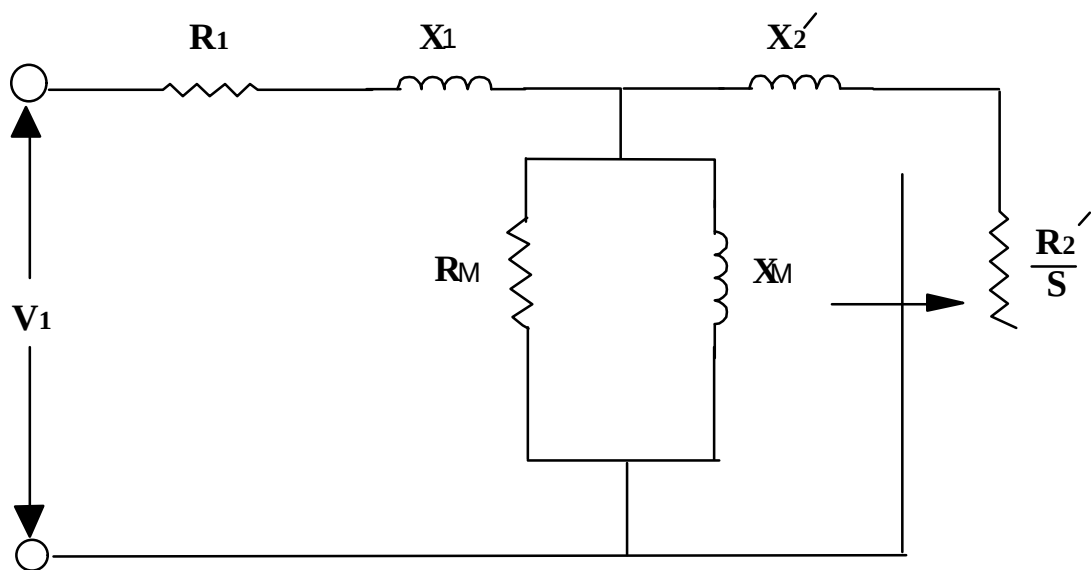


NEED NOT BE COMPLETED AT TENDER STAGE

DATA SHEET (Sheet 2 of 3)

HIGH VOLTAGE INDUCTION MOTOR





Machine Parameter	Locked Rotor Values OHM/Phase	Full-Speed Values OHM/Phase
R1		
X1		
RM		
X_2'		
R_2'/S		
S		

Note:-

Resistance Values to be those applicable to full load steady state conditions.

DATA SHEET (Sheet 3 of 3)

HIGH VOLTAGE INDUCTION MOTOR

DEFINITIONS AND ABBREVIATIONS**Definitions**

Standardised definitions may be found in the BP Group RPSEs Introductory Volume.

Abbreviations

API	American Petroleum Institute.
BS	British Standard.
BASEEFA	British Approvals Service for Electrical Equipment in Flammable Atmospheres.
CENELEC	European Committee For Electrotechnical Standardisation
EEMUA	The Engineering Equipment and Materials Users Association
EN	European Standard.
ESI	Electricity Supply Industry
HD	CENELEC Harmonisation Document
IEC	International Electrotechnical Commission
OCMA	Oil Companies Materials Association

LIST OF REFERENCED DOCUMENTS

A reference invokes the latest published issue or amendment unless stated otherwise.

Referenced standards may be replaced by equivalent standards that are internationally or otherwise recognised provided that it can be shown to the satisfaction of the purchaser's professional engineer that they meet or exceed the requirements of the referenced standards.

International Standards

IEC Publication 34	Rotating electrical machines
IEC Publication 79	Electrical apparatus for explosive gas atmospheres

European Standards

EN 50 014 (BS 5501, Part 1)	Electrical apparatus for potentially explosive atmospheres. General requirement
EN 50 016 (BS 5501, Part 3)	Electrical apparatus for potentially explosive atmospheres. Pressurised apparatus 'p'
EN 50 018 (BS 5501, Part 5)	Electrical apparatus for potentially explosive atmospheres. Flameproof enclosure 'd'.
EN 50 019 (BS 5501, Part 6)	Electrical apparatus for potentially explosive atmospheres. Increased safety 'e'.

British Standards

BS 3643	ISO metric screw threads.
BS 4800	Specification for paint colours for building purposes.
BS 4999	General requirements for rotating electrical machines
BS 5000	Rotating electrical machines of particular types or for particular applications.
BS 5265	Methods for the mechanical balancing of flexible rotors.

[BS 5345](#) Selection, installation and maintenance of electrical apparatus for use in potentially explosive atmospheres.

[BS 6121](#) Mechanical cable glands for elastomer and plastics insulated cables.

American Standards

[API Std 670](#) Vibration, Axial-Position, and Bearing-Temperature Monitoring Systems

[API Std 678](#) Accelerometer-Based Vibration Monitoring System

UK Industry Standards

[ESI 44-5](#) Testing the insulation systems of stator coils for rotating electrical machines (3.3 kV and above).

[EEMUA Publication No. 132](#) Specification For Three-Phase Cage Induction Motors.

[EEMUA Publication No. 133](#) Underground Armoured Cable protected against Solvent penetration and Corrosive attack.

[EEMUA Publication No.140](#) Noise Procedure Specification.

