
	ANGLO COAL SA SPECIFICATION	432001
	RECONDITIONING OF SUBMERSIBLE ELECTRIC MOTOR DE-WATERING AND SLUDGE PUMPS	ISSUE 0
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This document supersedes AAC Specification 432001 Rev 5

1 SCOPE

This specification details the requirements for the reconditioning of flameproof and non-flameproof electric motor submersible pumps.

2 TECHNICAL REQUIREMENTS TO BE SPECIFIED BY THE ENGINEER

The following requirements shall be specified on every invitation to tender, contract or order:

- Title, number, date and issue of this specification
- Pump make and type and voltage
- Requirements for FLP machines
- Cable length required
- Intrinsically safe pilot circuit requirements (FLP only)
- Details of any changes to the discharge connection
- Details of any cable plug requirements
- The responsible person/s who shall be issued with special keys to access the Starter Box.

3 DEFINITIONS

For the purpose of this specification the following definitions shall apply:

BS	:	British Standard
FLP	:	Flameproof
IEC	:	International Electrotechnical Commission
ISO	:	International Standards Organization
OEM	:	Original Equipment Manufacturer
SANS	:	South African National Standards


The following terms are defined in the General Conditions of Contract:

- Anglo American, Approved, Company, Contractor, Engineer

4 REQUIREMENTS

The pump shall be reconditioned to meet the specified design and performance requirements of the OEM. The Contractor shall be in possession of detailed manuals for the pumps being reconditioned. On receipt of a pump, the Contractor shall record the following details:

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- Company name
- If flameproof, SABS IA GME approval number (South Africa) or local equivalent
- Pump type and make
- Pump kW
- Pump voltage
- Pump serial number
- Flameproof or non-flameproof
- Company identification references

Replacement of components which are beyond repair shall be in accordance with the requirements of the OEM unless otherwise approved. Pumps other than Flygt may be fitted with alternate seals provided they carry the same warranty.

Upper and Lower Seals may be refurbished at an approved sub contracted repair facility nominated by the contractor. Refurbished Seals shall be lapped to not less than two (2) light bands and shall be warranted for a period of six (6) months.

Component parts subject to wear may be refurbished at an approved sub contracted repair facility nominated by the contractor. The refurbished components shall carry the same warranty as an OEM Part.

Sub contractors shall be approved by Anglo Technical QA Department.


4.1 MANDATORY WORK

- Collection from the Company
- Disassembly
- Cleaning
- Component inspection / assessment i.e. mechanical, electrical and if applicable FLP inspection
- Component testing i.e. electrical testing of the stator and cable testing
- Assembly
- Final inspection and testing
- Painting
- Delivery to the Company

4.2 MANDATORY REPLACEMENTS

- Bearings
- Cable gland sealing components
- Circlips
- Diode (FLP pumps only)
- Gaskets
- Locking plates or locking wire

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- Oil
- "O" rings
- Seals (see Clause 4)
- Impeller key and retaining nut

4.3 INITIAL CLEANING

Pumps shall be suitably cleaned by means of blast cleaning, solvent immersion, chemical solution or high pressure water jet prior to disassembly. Care shall be taken to avoid damage to machined surfaces and electrical componentry.

4.4 PUMP DISASSEMBLY

Pumps shall be disassembled in accordance with written procedures and the requirements of the OEM's manuals.

4.5 CLEANING PRIOR TO INSPECTION / ASSESSMENT

Component parts shall be suitably cleaned to enable adequate inspection.

4.6 CRACK DETECTION

Each item shall be visually examined for cracks. The examination of suspect material shall be extended to dye penetrant testing.

4.7 DRILLED AND TAPPED HOLES

Defective drilled and tapped holes shall be plug welded and reworked to the OEM requirements or fitted with Heli Coils or other approved insert. Defective drilled and tapped holes may be enlarged to the next largest hole diameter providing the practice is not detrimental to the operation of the pump.

4.8 SHAFTS

Shafts shall be supported on the bearing journal centres and checked for straightness.

Deviations greater than 0.07mm shall be cause for rejection.

Bent shafts shall not be straightened.


Bearing journal sizes shall be measured in two planes and recorded. The recommended sizes in the bearing supplier's catalogue shall be used as acceptance criteria. The lower limit shall be rounded down to the nearest 0.01mm. The upper limit shall be rounded up to the nearest 0.01mm.

Journal sizes outside the rounded limits shall be cause for rejection and discard or rework.

4.9 CASINGS, HOUSINGS, DIFFUSERS AND IMPELLERS

Wear parts which will prevent the pump from performing at 80% of its intended duty shall be replaced.

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Cracks in motor housings shall be cause for rejection.

Cracks in casings may be rectified using an Approved welding procedure.

4.10 ELECTRICAL

All electric motor reconditioning shall be performed in accordance with the requirements of AA SPEC 538029, Reconditioning of Small AC Flameproof Machines & Flameproof Ventilation Fans, and the OEM's requirements.

4.10.1 The electric motor enclosure shall be pressure tested with clean dry air at a pressure of 0,5 bar for a minimum period of 5 minutes, or as specified by the OEM. Any air leaks shall be cause for further investigation.

Maximum pressure drop (Bar) shall be calculated as follows

$$\text{Pressure Drop} = \frac{0,017 \times P_o \times T}{V}$$

P_o = Pressure in Enclosure

T = test time

V = Volume of the Enclosure

4.10.2 The oil chamber shall be filled with oil specified by the OEM. The chamber shall be filled to 80% of the volume or to a level as specified by the OEM.

4.10.3 Motor windings contaminated by oil, water or emulsion, shall be washed with cleaning solvents and baked dry. The Contractor shall carry out an insulation resistance test on the motor windings. Minimum resistance shall comply with AA SPEC 538029, Reconditioning of Small AC Flameproof Machines & Flameproof Ventilation Fans.

4.10.4 The motor stator shall be rewound if the continuity test per phase is broken.

4.10.5 Electrical components shall be examined and tested to ensure that they are correctly rated for the pump/voltage nameplate.

4.11 ROTORS AND ROTOR SHAFTS

Faulty or damaged cast aluminium rotors shall be replaced.


Rotor shafts which are corroded, bent, worn or have damaged threads or keyways shall be replaced.

4.12 CABLES AND ATTACHMENTS

Cables on FLP pumps shall have the power cores individually screened and shall comply with SANS 1520 Part 1 (South Africa) or equivalent local standard.

The cable length shall be as specified in the contract (see Clause 2). No taping or jointing repairs shall be permitted.

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4.12.1 A continuity test shall be conducted on the cable cores. The cable shall be replaced if the continuity is broken.

4.12.2 A visual inspection shall be performed on the cable sheath for damage, cuts, nicks or contusions which could allow water infiltration.

4.12.3 Cable insulations shall be tested between all conductors at 1000 Volts. The resistance shall not be less than 50MΩ when tested between conductors to earth.

4.12.4 The outer cable sheathing and individual cores shall be sealed by compression of rubber sealing bushes on the cable entry gland and be completely leak resistant.

Rubber sealing bushes shall not be re-used.

Pumps / Motors not terminating in Starter Panels shall be fitted with an approved plug appropriate for the service and duty if required by the Engineer (see Clause 2).

4.12.5 On FLP pumps the intrinsically safe pilot circuit shall be included in accordance with the Engineer's requirements.

4.12.6 FLP pumps shall be fitted with an approved Starter Box with minimum internal dimensions as follows:

Length 280mm, Width 280mm, Depth 215mm.

The Starter Box sub - contractor shall be approved by Anglo Technical QA / Electrical Departments. The contractor shall notify the Engineer if a FLP Pump is supplied without an approved starter box.

All Starter Boxes for FLP Pumps for underground applications with the exception of Greenside Colliery, shall be fitted with a M400, M440 or M500 Pump Manager. The use of the Pump Manager for Open Cast applications shall be at the discretion of the individual Colliery Engineering Manager.

The Pump Manager shall be uniquely identified to the Pump and shall be used to establish a probable cause of failure. The Pump, Motor, Starter Box and Pump manager shall be maintained as a complete and unique unit.

All FLP Starter Boxes shall be fitted with tamper proof triangular bolts.

The Company shall identify the responsible person/s that shall be issued with special keys to access the Starter Box.


Anglo Technical Electrical Department shall approve the contents of the Starter Box and wiring diagram.

4.13 SLEEVING OF BEARING POCKETS AND SHAFTS

Sleeving of bearing housings shall be performed by approved methods.

Weld repairs to Shaft bearing journals shall be performed using approved methods.

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4.14 BOLTS AND STUD LENGTHS

Bolts shall protrude not less than one and not more than three complete threads through the nut with the locking washers in position.

Where use is made of threaded holes, the bolt or stud shall enter the thread for a least 80% of the length of the threaded hole with the locking washer in position. Flat washers shall be fitted against the casing to facilitate ease of disassembly.

4.15 DISCHARGE CONNECTIONS

Discharge connections shall be checked for wear or damage and if found to be worn or damaged shall be repaired or replaced.

4.16 CORROSION PROTECTION

Corrosion protection shall comply with the repairer's standard as approved by the Engineer

4.17 FLAMEPROOF PARTS

Repair of flameproof parts shall be carried out in accordance with a documented procedures approved by the SANS and legal requirements. The requirements of AA SPEC 599001, General Requirements for the Manufacture and Repair of Explosion Protected Electrical Equipment, shall apply.

5 QUALITY ASSURANCE PROVISIONS

The requirements of AA STD 100 shall apply.

6 TEST AND INSPECTION METHODS

6.1 PERFORMANCE


6.1.1 The pump including the cable gland shall be fully submerged and shall be tested in accordance with the requirements of ISO 2548 and be operated at the designed operating speed for a period of 15 minutes, on a test rig which is capable of measuring head, flow and power.

During this period the Contractor shall record at least five duty points on the pump performance curve.

This information shall be plotted and compared with the OEM performance curve and shall be provided with every pump reconditioned. The Pump shall perform at a minimum 80% of the OEM Designed Performance Parameters.

6.1.2 Motor test certificates and pump performance curve shall be enclosed in a suitable waterproof package and wired to the Unit and addressed to the Engineer. Copies of the test certificates shall be attached to the delivery note.

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6.2 FLP INSPECTION

FLP inspection personnel shall be certificated by the SANS, in accordance with the requirements of SANS / IEC 60079-1 (South Africa), BS EN 60079-1 or equivalent local authority.

7 PACKING, MARKING AND STORAGE

7.1 PACKING

Pumps shall be protected against damage and adverse climatic conditions during transportation and storage. Pumps held in storage at the mine for longer than 6 months shall be retested. A sticker indicating this requirement shall be attached adjacent to the nameplate detailing the proposed date of retest. Pump Outlet Ports shall be blanked off to prevent ingress of foreign matter.


Scrap parts and assemblies shall be returned to the Company.

7.2 MARKING

A nameplate for FLP pumps in accordance with SANS / IEC 60079-1 (South Africa), BS EN 60079-1 or equivalent local standard shall be permanently attached to the pump (see Appendix C).

7.2.1 Cable ends shall be marked by approved means.

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APPENDIX A: RELATED DOCUMENTS

AA SPEC 432001 reconditioning of Submersible Electric Motor De-Watering and Sludge Pumps


Unless otherwise stated, the latest issue of the following documents shall be deemed to form part of this specification:

- AA SPEC 538029 : Reconditioning of Small AC Flameproof Machines & Flameproof Ventilation Fans
- AA SPEC 599001 : General Requirements for the Manufacture and Repair of Explosion Protected Electrical Equipment
- AA STD 100 : Quality Requirements for Suppliers of Critical Equipment
- BS EN 60079-1 : Electrical apparatus for explosive gas atmospheres – Part 1 Flameproof enclosures
- ISO 2548 : Acceptance test for centrifugal, mixed flow and axial pumps
- SANS 1520-1 : Flexible electric trailing cables for use in mines. Part 1 - Low voltage (640/1 100V and 1 900/3 300V) cables
- SANS/IEC 60079-1 : Electrical apparatus for explosive gas atmospheres – Part 1 Flameproof enclosures

APPENDIX B: RECORD OF AMENDMENTS

- Issue 0 : New document based on AAC Specification 432001 Rev 5 with general updates (T Foulger; December 2009)

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APPENDIX C: EXAMPLES OF MARKING PLATES

FLAMEPROOF REPAIR

JOB	<input style="width: 95%;" type="text"/>	SERIAL NO.	<input style="width: 95%;" type="text"/>
MAKE	<input style="width: 95%;" type="text"/>	TYPE	<input style="width: 95%;" type="text"/>
KW.	<input style="width: 95%;" type="text"/>	VOLTAGE	<input style="width: 95%;" type="text"/>
AMPS	<input style="width: 95%;" type="text"/>	R.P.M.	<input style="width: 95%;" type="text"/>
DUTY	<input style="width: 95%;" type="text"/>	DATE	<input style="width: 95%;" type="text"/>
G.M.E. No. / I.A. No.	<input style="width: 95%;" type="text"/>		
<p>ISOLATE SUPPLY BEFORE OPENING COVERS CONTRACTORS DETAILS</p>			

NON FLAMEPROOF REPAIR

JOB	<input style="width: 95%;" type="text"/>	SERIAL NO.	<input style="width: 95%;" type="text"/>
MAKE	<input style="width: 95%;" type="text"/>	TYPE	<input style="width: 95%;" type="text"/>
KW.	<input style="width: 95%;" type="text"/>	VOLTAGE	<input style="width: 95%;" type="text"/>
AMPS	<input style="width: 95%;" type="text"/>	R.P.M.	<input style="width: 95%;" type="text"/>
DUTY	<input style="width: 95%;" type="text"/>	DATE	<input style="width: 95%;" type="text"/>
<p>ISOLATE SUPPLY BEFORE OPENING COVERS CONTRACTORS DETAILS</p>			