




A Division of Transnet SOC Limited

TECHNOLOGY MANAGEMENT

SPECIFICATION

25 kV AC MANUAL OR MOTOR OPERATED TRACK SWITCH.

Author:	Engineering Technician Technology Management	N.C Mokhomo	
Approved:	Senior Engineer Technology Management	S Smit	
Authorised:	Principal Engineer Technology Management	K. Motupa	
Date:			24 May 2022

Circulation Restricted To:

Transnet and Relevant Third Parties

"I acknowledge that this document contains personal information as defined in the Protection of Personal Information Act, 2013 (the "Act"). By accessing/using this document, I consent to the processing of personal information in accordance with the requirements of the Act. Personal information contained herein will only be used for purposes of this document."

© This document as a whole is protected by copyright. The information herein is the sole property of Transnet SOC Ltd. It may not be used, disclosed, or reproduced in part or in whole in any manner whatsoever, except with the written permission of and in a manner permitted by the proprietors.

TABLE OF CONTENTS

1.0	SCOPE	4
2.0	BACKGROUND	4
3.0	ABBREVIATIONS	4
4.0	NORMATIVE REFERENCES	5
4.2	BS STANDARD:	5
4.3	SANS STANDARD:	5
4.4	TRANSNET SPECIFICATION	5
4.5	TRANSNET DRAWINGS	5
5.0	SERVICE CONDITIONS	5
5.1	ENVIRONMENTAL CONDITIONS	5
5.2	MECHANICAL SERVICE CONDITION	5
5.3	ELECTRICAL SERVICE CONDITIONS	6
6.0	TECHNICAL REQUIREMENTS	6
6.1	GENERAL	6
6.2	TRACK SWITCH	6
6.3	OPERATING ROD AND HANDLE	7
6.4	ENCLOSURE	7
6.5	MOTOR	8
6.6	MECHANISM	8
6.7	TELE-CONTROL	9
6.8	POWER SUPPLY	9
7.0	TESTING AND INSPECTIONS	9
8.0	RATING PLATE AND INSTRUCTION LABELS	10
9.0	DOCUMENTATION REQUIREMENTS	10
10.0	QUALITY ASSURANCE	11
11.0	PACKAGING, STORAGE AND HANDLING	11
12.0	GUARANTEE AND DEFECTS	11
13.0	TECHNICAL COMPLIANCE	11
	APPENDIX A: SCHEDULE OF REQUIREMENTS	12
	ANNEXURE B: TECHNICAL DATA SHEET	13

1.0 SCOPE

- 1.1 This specification details Transnet's requirements for the design, manufacture, delivery, installation and commissioning of the manual or Motor Operated track Switches (MOTS) for 25kV AC overhead traction system purposes.
- 1.2 This specification includes a manual operating track switch which consists of a disconnecting track switch, operating rod and handle.
- 1.3 This specification accounts for all components of a MOTS including:
 - 1.3.1 the Motor-operated device (MOD) which comprises of the motor, mechanism and heater that is housed in an enclosure,
 - 1.3.2 an operating rod,
 - 1.3.3 a disconnecting track switch and a MOTS control panel.
- 1.4 This specification should be read in conjunction with BBG 0855, which is the specification for the MOTS control panel, as well as detailed drawing BBC 8743 for the requirements of the track switch.
- 1.5 All components for manual track switch shall be procured collectively as per clause 1.2.
- 1.6 All components mentioned on clause 1.3 shall also be procured collectively to allow for operation of the motor operated track switch (MOTS).
- 1.7 This specification contains schedule of requirements (Appendix A) which must be completed by the relevant Transnet Representative.
- 1.8 This specification covers technical datasheet (Annexure B) which must be completed by the tenderer and must be submitted as part of the tender documents.

2.0 BACKGROUND

- 2.1 A Manual Track switch (MTS) or Motor operated track switch (MOTS) for 25 kV AC traction substation is installed outside at the track switch structure where the substation feeds different track feeding sections. A track switch is used to disconnect/isolate feeding sections for maintenance and faulty conditions. MTS allows for manual operation to drive the operating rod to open or close the switch blades of a track switch. Manual operation of track switches is locked with a padlock on manual handles either ON or OFF position to avoid self-operation.
- 2.2 MOTS consists of a track switch, operating rod, enclosure in-housing (dc motor, mechanical gears, heater etc) and telecontrol panel. It has the capability of being manually operated and motor operated mechanism. MOTS allows for remote operation of the motor mechanism that thrusts the operating rod to open or close the switch blades of a track switch. This operation will allow for electrical control to strategically operate track switches to isolate or restore a section when needed. The motor can also be manually operated in case if it cannot be remotely operated by telecontrol. It has ON and OFF position to indicate when the switch is on closed/open state.

3.0 ABBREVIATIONS

MTS:	Manual Track switch
MOTS:	Motor operated track switch.
MOD:	Motor operated device.
AC:	Alternating current.
DC:	Direct current.
Hz:	Hertz.
kV:	Kilo-Volts.
V:	Volts.
Pa:	Wind load in Pascals
°C	Temperature in degrees Celsius.

BSP: British standard pipe

4.0 NORMATIVE REFERENCES

4.1 Unless otherwise specified all materials used, equipment developed and supplied shall comply with the latest edition of the relevant British standard (BS), South African National Standards (SANS) or Transnet publications.

4.2 BRITISH STANDARD:

BS EN 10226-1: Pipe threads where pressure-tight joints are made on the threads. Part 1: Dimensions, tolerances and designation.

4.3 SANS STANDARD:

SANS 62-1: Steel Pipes. Part 1: Pipes suitable for threading and nominal size not exceeding 150mm

SANS 121: Hot dip galvanized coatings on fabricated iron and steel articles- Specifications and test methods

SANS 936: Spheroidal graphite iron casting

SANS 1091: National colour standard

SANS 1274: Coatings applied by powder coating process

SANS 1574-3: Electric flexible cores, cords and cables with Polyvinyl Chloride (PVC) insulation.

SANS 9001: Quality Assurance Management

SANS 10142: The wiring of premises. Part 1: Low-voltage installations.

SANS 60034-1 Rotating electrical machines – Rating and performance

SANS 60034-11 Rotating electrical machines – Thermal protection

SANS 60529: Degree of protection provided by enclosures (IP code).

4.4 TRANSNET SPECIFICATION:

BBG 0855: 3kV DC motor operated track switch control panel

4.5 TRANSNET DRAWINGS

BBC 8743: 25 kV AC Track switch assembly

BBD 7601: 25 kV AC Track switch (Switch blade set - Male and Female contact)

5.0 SERVICE CONDITIONS

5.1 ENVIROMENTAL CONDITIONS

Altitude: 0 to 1800m above sea level.

Ambient temperature: -10 °C to Plus 55 °C

Relative Humidity: 0 % to 90 %

Wind pressure: 750 Pa

Lightning conditions: 20 ground flashes/km² per annum

Pollution: Heavily salt laden with industrial pollutant including diesel-electric locomotive emission.

5.2 MECHANICAL SERVICE CONDITION

5.2.1 The design of the MTS or MOTS and associated equipment must account for vibration due to rail operation.

5.2.2 The MOD enclosure shall be designed to withstand all mechanical loads relevant to installation, maintenance, and service conditions, as depicted by this specification, without hindering the performance of the MOTS and its components during service.

5.2.3 Ensure all individual components of the MTS or MOTS are secured from becoming loose during service.

5.3 ELECTRICAL SERVICE CONDITIONS

5.3.1 The track-section switches are required to operate on a nominal 25 kV AC, 50Hz system. The voltage of which under normal operation may vary between 19,9 kV minimum and 30 kV maximum.

5.3.2 The following auxiliary supply voltages are available to supply the system:

- 230 V AC
- 24/110 V DC

A DC power supply for the motor operation will be provided at 24/110 V as per schedule of requirement and MOD heater will be operated on 230 V AC from the auxiliary supply.

6.0 TECHNICAL REQUIREMENTS

6.1 GENERAL

6.1.1 A 25 kV AC MTS shall be made of a disconnecting track switch, operating rod and handle.

6.1.2 A 25 kV AC MOTS shall be made of a track switch, motor-Operated device (MOD), mechanism, the operating rod and a control panel.

6.1.3 The depot shall indicate or choose the system required between clause 6.1.1 and 6.1.2 on Appendix A (schedule of requirements).

6.1.5 The MOD shall comprise of the motor, the mechanism, and the heater, which shall be housed in the enclosure.

6.1.6 MOTS must be compatible or integrated to the panel.

6.1.7 The requirements for the MOTS control panel shall be in accordance with BBG 0855.

6.1.8 Manual track switch or Motor operated track switch shall be installed outside near the vicinity of the track at the track switch.

6.1.9 All ferrous parts shall be galvanized to SANS 121 and any other materials prone to corrosion, shall be treated against corrosion.

6.1.10 The operation of the MOTS shall allow for both remote and manual/local operation.

6.1.11 All nuts and bolts must be of a suitable corrosion resistant material and combination may not seize.

6.2 TRACK SWITCH

6.2.1 The track switch shall be provided with arcing horns and suitable for normal live operation but off-load operation.

6.2.2 The detailed track switch shall be designed as per drawing BBC 8743.

6.2.3 The operation of the switch shall work on a principle of moving rod, fitted on a cup and opening with a downward and closing upward movement stroke handle of the operating rod.

6.2.4 The switch shall be mounted approximately 5.5 m above ground level.

6.2.5 An adequate means of adjusting the position of the moving contacts relative to the fixed contacts shall be provided.

6.2.6 Each track switch shall be installed with its own operating mechanism and control panel when applied with MOTS and with MTS it shall be installed with operating rod & handle.

- 6.2.7 The arcing horns shall be off hard drawn copper alloy and manufacturer shall ensure a good contact is made between the male and female arcing horns in the closed position.
- 6.2.8 During an opening operation the arcing horns must be the last point of contact between the track switch sides to allow for the efficient pulling of an arc away from the contacts.
- 6.2.9 The switch blades shall be supplied in accordance to drawing BBD 7601.
- 6.2.10 The switch blades and other current carrying components of the track switch shall be of suitable, corrosion resistant, high conductivity copper alloy, with exception of springs, clips or other components specified in the drawing.
- 6.2.11 The tenderer shall give details of the type of copper alloy used. The alloy must have a continuous rating of 1200 A or higher for the dimensions specified in BBD 7601.
- 6.2.12 The distance between any live portion of the switch and any metal portion normally earthed as well as the clearance in the open position between the fixed and moving contacts and arcing horn shall at least be 320 mm.
- 6.2.13 The depot shall indicate if the track switch tamper resistant spring lock device is required on appendix A.

6.3 **OPERATING ROD AND MANUAL HANDLE**

- 6.3.1 The rod shall be galvanized in accordance with SANS 121.
- 6.3.2 The cup end shall suit one BSP operating rod (6 m long) x 11 threads per inch and shall be installed in accordance with BS EN 10226.
- 6.3.3 All additional properties of the rod shall comply with SANS 62-1.
- 6.3.4 Manual track switches shall be fitted with handles.
- 6.3.5 Manual track switch handle shall be designed as per drawing BBB 2688 indicating a definite ON and OFF position.

6.4 **ENCLOSURE**

- 6.4.1 The MOD enclosure shall be able to accommodate all mechanisms of the motor operated device.
- 6.4.2 The material of the enclosure shall be of mild steel with a minimum thickness of at least 5 mm plate and hot dip galvanized according to SANS 121.
- 6.4.3 The enclosure shall be mounted on a mast structure at a minimum of 1.25m above ground level.
- 6.4.4 The enclosure shall have a designed additional dimension as to evade hindrances to equipment in the vicinity of the mast structure.
- 6.4.5 The enclosure shall be of vandal, tamper and weatherproof design.
- 6.4.6 The enclosure shall have a degree of protection rating or ingress protection (IP55) provided against the intrusion of solid objects, dust, accidental contact and water in accordance with SANS 60529.
- 6.4.7 The enclosure shall be powder coated according to SANS 1274 and painted with colour Battleship Grey.
- 6.4.8 The total paint thickness of the enclosure shall at least be 75 microns.
- 6.4.9 Contacts within the enclosure shall be impervious to dust/dustproof.
- 6.4.10 There shall be lockable door to open sideways and the door shall be suitable to be secured with a padlock.
- 6.4.11 There shall be an additional mounting bracket installed on the mast to accommodate the motor operated device and mechanism enclosure. This shall be specified by Transnet depot on appendix A.

-
- 6.4.12 Motor operating device and mechanism shall be enclosed in the non-flammable enclosure to mitigate possible fire-related risks.
- 6.4.13 A suitable terminal strip for connecting all incoming cables shall be provided in an accessible position in the mechanism box.
- 6.4.14 All internal wiring and cable terminations associated with the mechanism box shall be undertaken by the tenderer and shall be done in accordance with SANS10142 and clause 6.8.4.
- 6.5 **MOTOR**
- 6.5.1 The input voltage to the motor shall be 24 V or 110 V DC supply as per specified in Appendix A by the depot.
- 6.5.2 The DC motor design shall comply with SANS 60034-1.
- 6.5.3 The motor shall be of DC permanent magnets or electromagnetic windings to convert DC electrical energy into mechanical energy.
- 6.5.4 The motor shall be adequately rated for the duty cycle it is required to operate and comply with type S3 of SANS 60034-1, clause 4.2.
- 6.5.5 An operational time of not exceeding 8s shall be required per cycle to open/close the track switch.
- 6.5.6 Sufficient torque of the motor for the operation of closing and opening the track switch shall be determined by the manufacturer.
- 6.5.7 The tightening torque of the motor shall be determined by the manufacturer.
- 6.5.8 The motor shall be thermally protected against overload in accordance with SANS 60034-11.
- 6.5.9 The motor to operate the track switch shall be supplied from the control panel BBG 0855.
- 6.5.10 The motor shall be able to operate forward and reverse (bi-directional).
- 6.5.11 The open and closed operation of the switch shall be achieved by reversal and forward of the motor drive.
- 6.5.12 The motor shall be connected to the operating rod (as specified in section 6.3) through suitably designed gears.
- 6.5.13 The output of the motor shall be specified by the manufacturer as per clause 5.5.3 of specification SANS 60034 -1 in the technical datasheet Appendix B.
- 6.5.14 A limiter switch or an interlocking mechanism shall be installed that prevents manual operation when the selector is in the remote position.
- 6.5.15 A manual on/off switch shall be installed in the enclosure to allow for “remote” or “manual” selection of operation.
- 6.5.16 A handle/latch shall be installed such that when removed/moved in position, the mechanism will declutch the motor from the rod to allow for manual/local operation. This operation shall comply with the warning sign as per 8.4.
- 6.5.17 For manual operation the MOTS, 6.5.15 shall be executed followed by 6.5.16.
- 6.5.18 The thermostatically controlled heater shall be provided inside the enclosure to ensure reliable heating to prevent moisture condensation and corrosion of the system.
- 6.5.19 The heater shall operate on 230 V AC power supply.
- 6.6 **MECHANISM**
- 6.6.1 The mechanism shall comprise of a gear reduction and a worm drive system.
- 6.6.2 The worm drive shall be of self-locking, so that the forces from the disconnect do not affect the operating mechanism.
-

- 6.6.3 A clutch shall be included in the driving mechanism to ensure that the driving motor is protected should the limit switch fail to function, or the cycle of operation be interrupted between initiation and completion.
- 6.6.4 Limit switches shall be fitted so that they operate at the extremities of the stroke.
- 6.6.5 Limit switches shall be mounted on or in the drive mechanism or be suitably secured to the operating rod.
- 6.6.6 All limit switches and auxiliary contacts shall be suitably rated.
- 6.6.7 The contacts shall be constructed of silver or equivalent conductive material to minimize damage to contact surfaces due to arcing and oxidation.
- 6.6.8 All parts functioning as bearings (except motor bearings) shall be constructed of non-ferrous metal and shall be of a self-lubricating type.
- 6.6.9 The motor—driven operating mechanism shall have a removable handle for in situ, direct, manual operation of the track switch in the case of a mechanism or power failure.
- 6.6.10 The handle shall be housed/stored and padlocked inside the enclosure when not required. Unauthorized manual operation of the track switches shall be prevented as far as possible.
- 6.6.11 The provision must be made to bypass the motor and operate the mechanism with a hand crank handle for manual operation.

6.7 TELECONTROL

- 6.7.1 Provision shall be made for the closing, monitoring and tripping of the MOTS from the control office.
- 6.7.2 The MOTS shall be connected to the tele-control panels in accordance with BBG 0855.

6.8 POWER SUPPLY

- 6.8.1 The batteries shall supply MOD in accordance with clause 5.0 of BBG 0855.
- 6.8.2 There shall be a terminal strip on the enclosure to allow for at least 8 incoming terminals and a gland plate for the power supply cables to be connected.
- 6.8.3 The cabling for the supply and telecontrol shall comply with SANS 1574-3.
- 6.8.4 All the wiring inside the panel for low voltage circuits shall be done in accordance with SANS10142 and BBG0855, clause 5.7.
- 6.8.5 Transnet shall provide a 230V AC supply to the enclosure for the heater against condensation.

7.0 TESTING AND INSPECTIONS

- 7.1 Motor testing shall comply with the requirements of clause 8 from SANS 60034-1 and test results shall be provided.
- 7.2 The testing of the rod shall be in accordance with SANS 62-1.
- 7.3 Compliance to drawings and specification will be inspected and all components shall undergo functionality tests.
- 7.4 Items that are produced in batches shall be marked for identification and recorded on related records as per SANS 9001.
- 7.5 Sampling of the items shall be carried out in accordance with the SANS 9001 methodology.
- 7.6 Transnet reserves the right to be present at all tests and inspections as called for in this clause 6.0.

- 7.7 The responsibility of arranging the tests called for in this clause rests with the successful tenderer.
- 7.8 A Transnet Freight Rail, Technology Management (Electrical Technology) representative may request any additional test deemed necessary to ensure compliance.
- 7.9 The material certificate or tests sheets shall be submitted by the successful tenderer covering compliance of the specification.
- 7.10 All additional testing shall comply with the relevant standards for individual components, where test certification may be requested by Transnet.

8.0 RATING PLATE AND INSTRUCTION LABELS

- 8.1 All the nameplates and labels shall be in English.
- 8.2 The plates shall be made of durable material and be securely mounted.
- 8.3 The writing must be made with durable print and Letters with sufficient size to be clearly legible.
- 8.4 Warning signs shall be placed or indicated where necessary with a clear visible statement. A warning sign shall be placed within the enclosure with the following statement "DO NOT OPERATE WHILE HANDLE IS INSIDE".
- 8.5 Each assembling must be packaged with its own installations and instructions.
- 8.6 The individual components of the MTS and MOTS must be permanently marked with the following:
- 8.6.1 Original equipment manufacturers (OEM) name.
- 8.6.2 Transnet logo.
- 8.6.3 Dated Batch numbers.
- 8.6.4 Markings as required by individual component drawings.
- 8.6.5 Torque ratings for assemblies.
- 8.6.6 Tensile strength for relevant components.
- 8.6.7 The enclosure shall be marked to indicate the contents.

9.0 DOCUMENTATION REQUIREMENTS

- 9.1 All drawings and documents shall be written in English.
- 9.2 All units indicated in the documentation shall be in metric system.
- 9.3 The file containing documents and drawings should be numbered for easy identification and reference purposes.
- 9.4 TFR reserves the right to require any additional information: manuals, catalogues, drawings, etc. that may contribute to complete information supplied by the manufacturer.
- 9.5 The following technical documents shall be submitted with tender:
- 9.5.1 Completed technical datasheet (Appendix B).
- 9.6 The following technical documents shall be submitted by the successful tenderer.
- 9.6.1 The tenderer shall provide three or two visible copies of schematic and wiring diagrams with at least A3 size.
- 9.6.2 The tenderer must provide method of installation, Instructions/maintenance manual and catalogue.

10.0 QUALITY ASSURANCE

- 10.1 The successful tenderer shall maintain a Quality Management System (QMS) based on or certified to SANS 9001.

11.0 PACKAGING, STORAGE AND HANDLING

- 11.1 The tenderer shall ensure that the MTS or MOTS equipment's are packed in such a manner that it will be protected during handling and transportation.
- 11.2 Package must be clearly marked indicating all components contained in the enclosure.
- 11.3 Package must be marked with the storage instructions if required.
- 11.4 The MOTS enclosure shall be contained in bubble wrap for delivery and all components must be packaged to be transported on gravel roads without sustaining damage.
- 11.5 The control panel packaging shall comply with clause 11 of BBG 0855.

12.0 GUARANTEE AND DEFECTS

- 12.1 The appointed tenderer shall guarantee that the supplied MTS or MOTS conforms to Transnet's requirements.
- 12.2 The appointed tenderer shall accept liability for makers' defects, which may appear in design, material and workmanship.
- 12.3 The appointed tenderer shall provide all information regarding guarantees and warranties in writing.

13.0 TECHNICAL COMPLIANCE

- 13.1 Tenderers shall indicate clause-by-clause compliance document with the specification. This shall take the form of a separate document listing each of the specification's clause and sub-clause numbers, indicating the individual statements of compliance or non-compliance.
- 13.2 Statement of non-compliance shall be motivated by the tenderer, as per 13.1.
- 13.3 Tenderer(s) shall submit all technical documents called for in the specification.
- 13.4 Any items offered in accordance with other standards will be considered at the sole discretion of Transnet. The tenderer shall supply full details stating where the item differs from these specifications as well as supplying a copy (in English) of the recognized standard specification(s) with which it complies. Any deviations must be approved by the relevant Transnet, Technology Management department in writing.
- 13.5 Failure to comply with clauses 13.1, 13.2, 13.3 and 13.4 could preclude a tenderer from consideration.
- 13.6 In the event of any conflict between the various submitted relevant documents, the order of precedence shall be, and in consultation with Transnet Freight Rail, Technology Management (Electrical Technology) department:
- a) Legal and safety requirements.
 - b) This Specification.

END

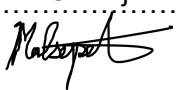
APPENDIX A: SCHEDULE OF REQUIREMENTS

(To be completed by Transnet Representative)

Name of the depot:		Port Elizabeth			
Please tick (✓/X) which system is required between MTS & MOTS (No1 or 2)					
No:	Description: Motor Operated Track Switch				
1.	Motor Operated Track switch (MOTS).	<input checked="" type="checkbox"/> Yes	YES	No	
	Enclosure				
	MOD [(Motor, mechanism, heater (in housed in the enclosure)]				
	MOTS Control panel (BBG 0855)				
	Disconnect Track switch (BBC 8743)				
	Operating rod				
1.1	Choose (Motor power supply voltage)	110 V DC	<input checked="" type="checkbox"/> 110V DC	24 V DC	
1.2	Tenderer to supply bracket for mounting enclosure (Mild steel).	Yes		<input checked="" type="checkbox"/> No	
1.2.1	If yes provide, a) Type of mast for the brackets to be mounted on,				
	b) Mast size,				
	c) Drawing number (Submit drawing if available CEE-TMF-0429 etc).				
1.3	Tamper resistant spring lock device for track switch (required)? [Track switch locking device – BBB5971] Store item number: 54005276	Yes		No	
2.	Manual track switch (MTS).	Yes		No	
	Disconnect Track switch (BBC 8743)				
	Operating rod				
	Handle (BBB 2688)				
2.1	Tamper resistant spring lock device for track switch (required)? [Track switch locking device – BBB5971] Store item number: 54005276	Yes		No	

Completed by Aletta Magampa

Capacity NEC Project Supervisor

Signature 

Date 16/11/2023

"I acknowledge that this document contains personal information as defined in the Protection of Personal Information Act, 2013 (the "Act"). By accessing/using this document, I consent to the processing of personal information in accordance with the requirements of the Act. Personal information contained herein will only be used for purposes of this document.

ANNEXURE B: TECHNICAL DATA SHEET

(To be completed by the tenderers and submitted as part of their tender)

- 1.0 Track-switch:** Manufacture.....
 Type of bearings or guides.....
 Attach all relevant technical information as per BBC 8743.....
- 1.1 Main switch contacts**
- 1.1.1 Type of copper alloy.....
 1.1.2 Rating of copper alloy.....A
 1.1.3 Actual minimum clearance from live portion of switch, to any earth portion.....
 1.1.4 Clearance between opened contacts.....mm
- 1.2 25kV AC MOTS control panel**
 Attach all relevant technical information as per BBG 0855.....
- 2.0 Enclosure**
- 2.1 Weight.....kg
 2.2 Dimensions.....mm
 2.3 Ingress Protection.....
- 3.0 Mechanism**
- 3.1 Type of bearings.....
- 4.0 Motor**
- 4.1 Manufacture.....
 4.2 Type of motor.....
 4.3 Rated voltage.....V
 4.4 Type of duty.....V
 4.5 Operation time.....Seconds(s)
 4.6 Nominal output.....W
 4.7 Nominal current.....A
 4.8 Nominal Speed.....rpm
 4.9 Direction of rotation.....rpm
 4.10 Continuous Torque.....Nm
 4.11 Tighten Torque.....Nm
- 5.0 Heater**
- 5.1 Supplied Voltage.....V
 5.2 Thermostat.....yes/no.....

"I acknowledge that this document contains personal information as defined in the Protection of Personal Information Act, 2013 (the "Act"). By accessing/using this document, I consent to the processing of personal information in accordance with the requirements of the Act. Personal information contained herein will only be used for purposes of this document."