ABU DHABI SEWERAGE SERVICES COMPANY (ADSSC)

GENERAL SPECIFICATION FOR ELECTRICAL WORKS

DIVISION 16 ELECTRICAL

SECTION 16090 MOTOR PROTECTION RELAYS

DOCUMENT CONTROL SHEET

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02		
03		
04		
05		
06		
07		
08		
09		
10		

TABLE OF CONTENTS

1 GENERAL

All items described within this section shall comply with the provisions of Section 15001: General M&E Requirements.

2 ELECTRONIC MOTOR PROTECTION RELAY (EMPR)

2.1 GENERAL

a) The Electronic Motor Protection Relay (EMPR) shall be an intelligent electronic device that is user-friendly, user-configurable and capable of controlling the motor manually or automatically.

b) The EMPR shall be CE marked and conform to BS EN 60947-1.

c) An EMPR with LCD display shall be provided in the MCC for each sewage pump motor starter regardless of the rating of the pump and for non-sewage pump drives above 11kW. It shall be mounted on the cubicle door, feature function keys and be a minimum of IP54.

d) Non-sewage pump drives up to 11kW inclusive may be provided with an ambient compensated bi-metal type thermal overload relay.

e) The EMPR shall have built-in RS485 communication port utilising Modbus RTU protocol for serial communication with other devices on the network.

f) The EMPR shall be supplied with software, user manual and interconnecting cables.

g) The EMPR shall be provided with user-friendly software, Windows-based communication, to allow easy access to all features with pull-down menus.

2.2 PROTECTION FEATURES

a) The protection features shall include the following as minimum:

i. Overload protection.
ii. Overcurrent protection.
iii. Overvoltage protection.
iv. Undervoltage protection.
v. Undercurrent protection.
vi. Phase sequence.
vii. Phase imbalance.
viii. Phase loss.
ix. Earth leakage.
x. Earth fault.
xi. Thermistor broken.
xii. Open contactor.

xiii. Locked rotor.

2.3 MEASUREMENTS

a) Motor current sensing shall be through external 5A or 1A current transformer. The following measured values shall be displayed:

i. RMS current of each phase.
ii. RMS voltage.
iii. Earth leakage current.
iv. Continuous monitoring of thermal capacity of the motor.
v. Thermal capacity used during start.
vi. Power factor of the motor.
vii. Motor kW.
viii. Phase unbalance.
ix. Parameter settings.
x. Percentage of FLC of the motor.
xi. Adjustable delayed start/stop.
xii. Maintenance log.

b) The EMPR shall be capable of registering all trip commands and log trip and pre-trip metering values for reporting and printing purposes.

2.4 PROGRAMMABLE RANGES

a) Overload – Shall be based on the calculation of accumulated I^2t value and selected thermal capacity curve. The tripping time shall be 0-10 seconds adjustable.

b) Locked Rotor – To trip the motor within 1 to 5 seconds when the running current exceeds the stalled rotor trip level of 1.5 to 5.0 × FLC.

c) Phase unbalance – Should there be a phase current unbalance of greater than 15% lasting for 5 seconds an alarm shall be generated. If the condition is true for 10 seconds or more a trip shall occur.

d) Ground fault – The ground fault shall be measured as a percentage of primary range of current transformer. The setting range for the ground current shall be 0.1 to 1.0 × ground fault CT primary current. An adjustable delay time of 0-30 seconds shall allow preventing nuisance alarm from momentary surges. It should be possible to make the alarm setting below the trip level to indicate early warning insulation breakdown.

e) Thermistor/Over-temperature – The EMPR shall be capable of accepting PTC and NTC sensors. Thermistor level shall be selectable for both alarm and trip conditions with an adjustable time delay of 0-5 seconds.

f) Undercurrent shall be adjustable between 10 and 100% of motor FLC with a time delay of 0-30 seconds.

3 THERMAL OVERLOAD RELAY

a) The thermal overload relay, where specified, shall be of bimetallic inverse time-lag type, and be used with a contactor in the starter circuit enabling switching device to open both control and power circuit (fully isolating the power to the motor terminal box) when the current in the relay exceeds a predetermined value.

b) The thermal overload relay shall fully comply with the requirement of BS EN 60255-8.

c) The thermal overload relay shall be simple and robust suitable for direct contactor mounting, or if mounted separately shall be used with manufacturer-supplied links and associated attachment.

d) The thermal overload relay shall be designed to include ambient temperature compensation feature from –20ºC to +65ºC; so eliminating the need for calibration in the field during operation.

e) The thermal overload relay shall provide the following protections:

   i. Overcurrent/Overload.
   ii. Single phasing/Phase failure.

f) The thermal overload relay shall have MAN/AUTO field convertible 'Reset' button located on top of the relay for resetting of the relay after trip. Additionally, a facility shall be provided on the door of the starter compartment to reset the relay if so required/specified.

g) The thermal overload relay shall have two characteristics: one when the relay bi-metals are in cold state that will break the contacts of the relay within 810 seconds; and the other when in hot state the contacts breaking shall be reduced to approximately one third of the tripping time as indicated for the cold characteristics. The tripping time may be allowed to vary depending upon the starting of the motor such as normal/heavy-duty.

h) The thermal overload relay shall have been type tested and ASTA certified to achieve Type 2 Co-ordination in accordance with BS EN 60947.

4 THERMISTOR RELAY

a) All motors, where recommended by the manufacturer or 30kW and above, shall be protected against excessive temperature, poor cooling, high ambient temperature, high starting frequency etc. by thermistors.

b) Thermistors shall be of PTC (Positive Temperature Coefficient) type made of platinum wire Pt100 having resistance of 100Ω at 0ºC. They shall be embedded in the stator winding/slot and the leads of the elements brought out to a separate terminal block located within the junction box of the motor.

c) Thermistors shall have a tamper-proof pre-set point and a fast response time.

d) Thermistor relays shall include the following features:

i. Tamperproof.
ii. Rapid responding.
iii. UL/CSA recognised component.
iv. Elimination of nuisance trips.
v. Field-proven Klixon (or similar) design.
vi. Requiring no field adjustment.
vii. Allows full use of motor rating.
viii. Directly senses winding over-heating.

e) Thermistor relays shall also protect the motor against the following conditions:

i. Locked rotor.
ii. Running overload.
iii. Single phasing.
iv. Voltage unbalance.
v. High motor ambient temperature.
vi. Blocked ventilation.

f) Thermistors shall be connected to a separate control unit to enable tripping of the motor through the starter contactor upon change of thermistor resistance beyond a pre-determined value.

g) The wiring of the relay module shall be arranged such that the condition latches and inhibits starting of the pumps even after the temperature sensors have cooled and re-closed the circuit. A facility shall be provided in the motor control centre to reset the control circuit manually.

h) In addition to the sensing of winding temperature by the thermistor, means shall be provided to monitor the bearing temperature wherever recommended by the motor manufacturer.

5 MOISTURE AND MECHANICAL SEAL LEAKAGE PROTECTION RELAY

a) All sewage pump motors shall be provided with dedicated moisture and mechanical seal leakage protection relay, as recommended by the manufacturer and/or as indicated in the Particular Specification.

b) Moisture sensing probes shall extend into the oil chamber located between the lower (outer) and upper (inner) seals to detect the presence of moisture on failure of the outer seal.

c) The probes shall also detect water in the motor chamber and provide a warning prior to the water reaching the bearing or wound stator assemblies. The sensor leads shall be connected to a moisture relay equipped with alarm contacts for indication.

d) The moisture detection relay shall be supplied by the pump motor manufacturer and to be free-issued by the Contractor to the Motor Control Centre Vendor, together with detailed schematic diagrams and work instructions pertaining to the mounting and location of the relay.

e) The Motor Control Centre vendor shall strictly adhere to the wiring practices and works instructions as provided by the manufacturer.

6 EARTH LEAKAGE CIRCUIT BREAKER (ELCB)

a) An Earth Leakage Circuit Breaker (ELCB) shall be provided as recommended by the manufacturer and/or as indicated in the Particular Specification.

b) The ELCB shall confirm to BS EN 61008.

c) The ELCB shall have the following main features, as a minimum:

i. Immunity from nuisance tripping.
ii. Protection against direct and indirect contact.
iii. Continuous monitoring of the leakage current.
iv. Capable of operating under all unbalanced phase conditions.
v. Alarm contact with fail-safe operation.

7 SOURCE TESTS

a) Provide testing of Motor Protection Relays as described herein and covered under provisions of Section 15001: General M&E Requirements.

b) All Motor Protection Relays shall be witness tested as integral units forming part of the Factory Built Assembly for a complete sequence of operation and as laid down in BS EN 60439-1.

c) Secondary injection tests to ensure correct operation of the current and voltage operated protections over their full range of settings.

d) Software simulation test where applicable shall be demonstrated to prove the satisfactorily operation of the protection devices.

d) The complete assembly shall not leave the manufacturer's works until the same have been duly approved and stamped by ADSSC and written permission is obtained for their dispatch to site.

END OF SECTION