



ABU DHABI SEWERAGE SERVICES COMPANY (ADSSC)

GENERAL SPECIFICATION FOR ELECTRICAL WORKS

DIVISION 16 ELECTRICAL

SECTION 16070 STARTERS

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DOCUMENT CONTROL SHEET

Revision No.	Date	Revision Description / Purpose of Issue
01	April 2008	First Issue.
02		
03		
04		
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1. GENERAL

- a) The Contractor shall comply with the provisions of Section 15001: General M&E Requirements.
- b) Starter components shall form part of a Motor Control Centre (MCC) described under Section 16020: Factory Built Assembly (FBA) and Section 16030: Motor Control Centre (MCC) and as such circuit connections, protection devices and the like shall comply with BS EN 60439-1.
- b) Starters and their components shall provide Type 2 Co-ordination to BS EN 60947-4-1. They shall be so arranged to provide easy access to all components for maintenance purposes.
- c) Starter shall be damp-proof and dust-proof with a minimum Ingress Protection (IP) rating of IP 54.
- d) Motor starters shall be rated to carry full load current of its rated duty at its most severe load conditions.
- e) All starters shall be selected for Utilisation Category AC3 duty and be capable of at least 15 starts per hour at 100% full load torque.
- f) The starting method employed to start the motors shall be as described herein, unless specified otherwise on relevant contract drawings.
- g) Standalone Unit Control Panels, where supplied by a manufacturer of Packaged Type Plant, shall confirm to the requirements specified herein.
- h) All starters shall be provided with phase failure and phase reversal protection.

2. DIRECT ON LINE FULL-VOLTAGE MOTOR STARTER

2.1 UP TO 4.0KW INCLUSIVE

'Direct-on-Line' (DOL) starters shall be designed to start and accelerate the motor to normal speed and provide overload protection to the motor and its associated power circuit by switching off the motor by disconnection of the supply. The reversing full-voltage DOL starter shall be similarly designed, as required.

3. STAR/DELTA (S/D) REDUCED-VOLTAGE MOTOR STARTER

3.1 5.5KW – 11.0KW INCLUSIVE

- a) Star/Delta starters shall be designed to start and accelerate a 3-phase motor in such a way that the stator windings are connected in 'Star'

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initially and after a recommended time delay are connected in 'Delta' for final running.

- b) The S/D starter shall provide suitable overload protection by disconnection of the supply to the motor.
- c) The transition from Star to Delta must occur when the motor is approaching full speed in Star. The transition time between the Star and Delta contactors shall be adjustable to ensure that the Star contactor is opened before the Delta contactor is closed.
- e) The motor shall have 6 terminals in the junction box of the motor with a shorting strip to facilitate Star/Delta starting.
- f) Resisting torque during starting shall be less than 1/3rd of the maximum rated motor torque.
- g) Closed-transition type S/D starters shall include wire-wound porcelain core resistor banks of sufficient thermal rating to allow three consecutive starts of 30 seconds starting period followed by a 15 minutes rest and another 30 seconds starting period. Resistance values shall be chosen to give high starting current with low transients current. Starter compartments incorporating resistor banks shall be ventilated as necessary.

4. SOFT STARTERS

4.1 15.0KW AND ABOVE

- a) A solid state, microprocessor-based, reduced-voltage soft starter shall consist of six silicon-controlled full-wave rectifiers, two rectifiers per phase connected back-to-back in reverse configuration.
- b) Softstarts shall be employed to reduce the voltage across the motor terminals during the starting process resulting in reduced torque from the motor. The voltages across the motor to be increased and decreased progressively in such a way that facilitate a stepless start and stop of a motor.
- c) The softstart shall be provided with one isolation contactor to provide positive isolation from the Mains and one bypass contactor to bypass the softstart power section when the motor is up to speed.
- d) The starter shall be equipped with metal oxide varistor-type surge suppressors across the SCR to protect against voltage transients and resistor/capacitor snubber network to protect against false firing of the SCR.
- e) A temperature sensor shall be embedded to the heat sink of each SCR to protect the softstart from over-temperature condition.

- f) Any failure in the soft starter shall be indicated on the cubicle door through LCD display or LED indicator without requiring to open the door.
- g) The softstart shall be supplied factory-configured ready to commission, without requiring any parameter adjustment or reconfiguration at site.
- h) The softstart shall have the following protective feature as minimum:
 - i. Over-temperature.
 - ii. Overload.
 - iii. Jam.
 - iv. Stall.
 - v. Phase loss.
 - vi. Phase reversal.
 - vii. Shorted SCR.
- i) The softstart shall have the following control features as a minimum:
 - i. Kick Start 0-85% locked rotor torque – 0 to 2s.
 - ii. Ramp Start 0-85% locked rotor torque – 1 to 60s.
 - iii. Current-Limit Start 0-85% locked rotor current – 1 to 60s.
 - iv. Soft Stop – 0 to 60s.
- j) The softstart shall be provided with high-speed fuses as recommended.
- k) Each starter shall be housed in a separate compartment equipped with the following:

Refer also to the relevant Specification for complete details of individual components.

- i. 1No. Triple-pole MCCB externally-operated through a door-mounted handle interlocked with the cubicle door, with built-in shunt trip coil-operated through a field-mounted emergency push button and panel-mounted Earth Leakage Sensor (ELS).
- ii. 1No. Thermal Overload Relay or Digital Electronics Motor Protection Relay (EMPR) to provide protection of motors against undervoltage, overvoltage, undercurrent, overcurrent, phase sequence, phase imbalance, phase loss, earth leakage etc.
- iii. 1No. Set of AC3 duty contactors, as required according to the starter type, size and configuration.
- iv. 1No. Set of auxiliary relays and timers required to provide the necessary indication, control logic sequence and functional requirements.
- v. 1No. 240/110V 50Hz double-wound single-phase centre-tap transformer with earth screen of suitable capacity to supply all control circuit and pilot devices requirements.
- vi. 1No. anti-condensation heater (off when starter contactor is closed). The heater shall be separately fused and controlled by a hygostat

- having setting range (50-100%) that operates when the preset value of %RH exceeds the dew point.
- vii. 1No. Thermistor relay for starters controlling motors 30kW and above or as recommended by the plant/motor manufacturer or where specified separately.
 - viii. 1No. Moisture/Mechanical seal leakage protections relay as recommended by the plant manufacturer or where specified separately.
 - ix. 1No. Door-operated TEST/NORMAL push button located inside the starter compartment wired through auxiliary contact of the MCCB for the purpose of conducting live functional tests to the control circuit whilst the main MCCB is isolated. (Delete this function where inappropriate, subject to the approval of the Engineer).
 - x. 1No. Set of main motor terminals and auxiliary terminals as required for remote controls and indications wherever applicable.
 - xi. 1No. Set of volt-free terminals (digital and analogue) as required for the Telemetry RTU located in a separate MCC section sized sufficient to accommodate free-issue RTU together with associated hardware as per the detail furnished in the RTU section described under section Instrumentation's, Controls and Automation (ICA).
 - xii. Intrinsically-safe barriers protection shall be provided for signals wired to terminals for field-mounted equipment located in potentially-explosive atmospheres containing gasses such as H₂S and Methane.
 - xiii. The following equipment shall be mounted on the door of each starter cubicle as a minimum, unless specified elsewhere:
 - 1No. Ammeter fitted with suppressed scale and RED pointer to read and monitor motor running and starting current.
 - 1No. Green pilot lamp to indicate "SUPPLY ON".
 - 1No. Red pilot lamp to indicate "MOTOR RUNNING".
 - 1No. Amber pilot lamp to indicate "MOTOR FAILED".
 - 1 No. "HAND/OFF/AUTO" selector switch.
 - 1 set "START/STOP" push buttons.
 - 1No. Lamp test push button.
 - 1No. externally-operated overload reset push button, if required.
 - 1No. 6-digit hours run meter to count total operating time of the motor. It shall be of the non-resettable type.
 - 1No. Digital counter for counting accumulated number of starts. It shall be of the non-resettable type.
 - A separate indication lamp to indicate each motor fault condition.
 - A common fault indication shall be provided for all fault conditions. The indication lamp shall be provided on the door of dedicated common control compartment. Additionally, a set of wired terminals shall be provided to hook-up flashing light on the building roof.
 - Other pilot devices for control and indications as described under Section 16110: Pilot Devices shall be provided accordingly.

- Components not described herein but necessary to meet the requirement of the User Requirement Specification (URS) as described in Section 16670 Documentation Format shall be included.

5. CONTACTORS

- a) Contactors shall confirm to standard BS EN 60947-4-1 Utilisation Category AC-3, type tested and ASTA-certified to achieve Type 2 Co-ordination.
- b) All power and control wires terminated on the contactor terminals shall be easily accessible from the front.
- c) Contactor design shall allow for inspection of the main contacts and operating mechanism for servicing and maintenance without disconnecting the power cables.
- d) Terminals used for power and control circuit wiring must provide IP2X protection as minimum with the starter compartment door opened.
- e) Contactor shall be 3- or 4-pole according to the application requirements.
- f) When selecting contactors for Power Factor Correction Capacitors and Lighting duty, they must confirm and tested to the duty in accordance with the relevant standard.

END OF SECTION