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3 PROTECTIVE DEVICES

3.1 GENERAL

3.1.1 Scope

1 This Part shall specify the requirements for protective devices.

3.1.2 General Reference

1 The work of this Part is integral with the whole of the Project Documentation and is not intended to be interpreted outside that context.

2 Co-ordinate the work with all other services affecting the work of this Section.

3 For voltages and frequencies, regulations and requirements of Kahramaa and relevant authorities should be taken into account.

3.1.3 Ratings

1 The ratings of the various overcurrent protective devices shall be, in general, as indicated on the Project Drawings. However, the protective device ratings shall be confirmed based on the equipment and items being provided by the Contractor. Contractor shall provide calculation and justification for proposing any change in the rating.

3.1.4 Standards

1 The following standards shall be followed:

BS 88..... Cartridge fuses

EN 60255, IEC 255 ....Measuring relays and protection equipment

EN 60269, IEC 269 Low-voltage fuses

EN 61008-1 .....Residual current operated circuit-breakers without integral overcurrent protection for household and similar uses (RCCBs)

EN 60898, IEC 157-1A Miniature and Moulded Case Circuit Breakers

EN 61810-1 .....Electrical Relays

EN 60947, IEC 947-2 .Low Voltage circuit breakers

3.1.5 Overcurrent Protective Device Co-ordination

1 The Contractor shall carry out and provide an overcurrent protective device. Co-ordination study as part of his material submission, as outlined below:

2 Properly co-ordinated automatically operated overcurrent protective devices shall be provided for this Project. The overcurrent protective devices shown on the Drawings shall be co-ordinated for adequate continuous current and interrupting capacity to assure proper overcurrent protective devices operation under normal and fault conditions in the system.

3 All overcurrent protective devices on this Project and the first upstream device of the existing electrical system shall be co-ordinated so that they will perform as follows. When two or more overcurrent protective devices (including the first upstream protective device of the existing system) in series with each other experience current flow greater than their rated current, the device with the lowest rated current shall trip and/or open the circuit first and thereby prevent the higher rated devices from operating.

4 The Supplier of the overcurrent protective devices shall prepare a co-ordination study to verify the above stated performance requirements. The study shall be documented by the Supplier and the documents shall include but not be limited to the following:

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(a) a composite drawing or drawings (on full size, reproducible, log-log paper) showing the entire new electrical system (including the first upstream protective device of the existing system) showing all protective device curves (including motor overloads), short circuit duties, motor starting curves and damage curves for motors, equipment and conductors. This drawing or drawings shall show that all protective devices are properly co-ordinated to perform as stated above

(b) manufacturer's overcurrent operating curves (on full size, reproducible, log-log paper) for each overcurrent device. In the case of fuses, both minimum melt and maximum clearing time curves shall be included

(c) reproducible copies of all Project single line diagrams so marked to show short circuit duties at all switchboards and motor control centres, and which operating curve applies to each overcurrent device on the diagram (the operating curves shall also be correspondingly marked)

(d) a tabulation of the short circuit duties at all switchboards and motor control centres, sizes and ratings of all overcurrent protective devices and the required settings of all of the adjustable overcurrent protective devices so that the performance requirements are met. Protective devices which have earth fault protection features are specifically required to meet this performance requirement.

5 This documented co-ordination study shall be submitted for review before the overcurrent devices are supplied for the Project.

3.1.6 Quality Assurance

1 The suppliers manufacturing facility shall be certified to the ISO - 9001 series of standards from the International Standards Organisation.

3.1.7 Manufacturers

1 Preference will be given to one manufacturer of ACB, MCCB and MCB to ensure proper co-ordination in accordance with Clause 3.1 above.

3.2 PRODUCTS

3.2.1 Air Circuit Breakers

1 To IEC 947-2 or EN 60947-2, suitable for triple pole service and shall have breaking capacity of 50 kA symmetrical for 3 seconds at 415 Volts.

2 ACBs shall be of the horizontal withdraw able, load making and breaking type with the contacts being of the double break pattern with arcing chutes, shutters etc. The main arcing contacts shall be of the high pressure butt type with wipe and roll action on opening and closing. The main contacts shall be of silver alloy.

3 Removable arc chutes shall be fitted together with an air circuit breaker. ACB shall be complete with a mechanical ON/OFF position indicator, pad-lockable. ACB shall conform to B.S. En 60947-2 (EN 60947-2, IEC 947-2) and B.S. En 60664-1.

4 Each circuit breaker shall be enclosed in sheet steel and provided with three phase manual and automatic isolating devices suitably interlocked so as to prevent isolation except when the circuit breaker is in open position. It shall be arranged in such a manner that it will not be possible to withdraw the breaker or remove the front cover unless the ACB is in the isolated position.

5 Provision shall be made for locking the ACB in this position (isolated position).

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6 Shutters shall be provided to protect the live terminals against accidental touch when the ACBs are in a fully withdraw able position. The ACB shall have solid sate overload and short circuit protection devices along with earth fault trip mechanism. The solid state circuit shall be provided with proper LED indication to indicate the trip status of the ACB. The ACBs shall be equipped with shunt trip of 30V DC trip mechanism for tripping the breaker with restrictive earth fault relay to be provided separately with suitable size of CTs.

7 The Air Circuit Breakers (the conventional type and not moulded case circuit breaker) shall be 500 V, 50 Hz, triple pole with neutral link for incoming and outgoing ACB or four poles for bus tie ACB only with ratings as shown on the Drawings. They shall be air break, trip free, draw-out type with mechanical and electrical ON/OFF indicators.

8 Where air circuit breakers are to be electrically operated by automatic motor wound spring mechanism, a standby manual operating handle shall be provided for operating the circuit breaker in case of power or motor failure.

9 The air circuit breaker shall be provided with built-in overcurrent, short circuit and Earth fault protection having the following characteristics:-

(a) adjustable long time delay current setting between 50 – 200% with variable tripping time characteristics.

(b) adjustable short time delay current setting 200 – 800% with variable tripping time characteristics.

(c) instantaneous tripping for heavier over current applications adjustable from 400 – 1600% of the base current.

(d) adjustable earth fault trip current setting 20 – 80% with variable tripping time characteristics.

10 The circuit breaker shall have three position on the draw-out mechanism, namely service position where all main and auxiliary contacts are made, test position where main contacts are open but auxiliary contacts are closed and isolated position where all contacts are open. An indicator shall clearly show these positions and provisions shall be made for locking the breakers in any position. ON/OFF indicator shall be provided.

11 Mechanical Interlocks shall be provided to prevent withdrawing or inserting of the breaker when it is 'ON'. Any attempt to do so shall trip the breaker automatically.

12 The withdrawable part of the circuit breaker shall be effectively connected to earth through scraping contacts that shall make before and break after the main and auxiliary contacts.

13 The moving contacts comprising the main and arcing contacts shall be of the spring loaded, self aligning type. The arc contacts shall be arranged to make before and break after the main contacts.

14 The air circuit breaker shall include but not limited to the following as minimum:-

(a) 8NO/8NC auxiliary contacts

(b) arc chutes

(c) folding extension rail

(d) charging handle

(e) open and close push buttons

(f) trip indicator

(g) spring charge motor

(h) spring charge indicator

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(i) breaker position indicator mechanically and electrically.

(j) micro-processor based protection and management unit that provides the following control and monitoring features:-

(i) overcurrent protection
(ii) short circuit protection
(iii) earth fault protection
(iv) neutral protection
(v) thermal memory
(vi) alarm logging
(vii) field selectable Manual or Auto reset
(viii) microprocessor malfunction watch dog
(ix) programmable input/outputs
(x) load monitoring
(xi) operation counter
(xii) serial communication.

(k) carriage/Lifting Truck for ACB exceeding 25 Kg in weight [One carriage for each site/project regardless of number of breakers provided

(l) shunt trip and under voltage release

15 The Main Incoming Circuit Breakers shall be provided with cable terminal boxes to suit the incoming cables from the transformer/source supply. The gland plate for the incoming cables shall be non-ferrous material brass compression type glands, earthing tags and shrouds. In case single core PILCA/PVC cables are used, the clamping arrangement is to supplied as per the sketch nos. 9 & 10 shown on pages 144/145 of KAHRAMAA regulations.

16 Circuit breakers shall be tropicalised to operate continuously in an ambient temperature of 55 °C and high relative humidity.

17 Type test certificate for each size of circuit breakers and MCCB from an internationally recognised testing authority acceptable to the Engineer shall be provided.

18 The ACB shall have adjustable settings and the following facility:

(a) Long time current setting and tripping delay.
(b) Overload signal.
(c) Short time pick up and tripping delay.
(d) Instantaneous pick-up.
(e) Earth leakage test button.
(f) Long time rating plug screw.
(g) Test connector
(h) Lamp test, reset and battery test.
(i) Indication of tripping cause.
(j) Digital display.
(k) Three phase bar graph and power display.
(l) Setting / programmable buttons.

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19 The ultimate breaking capacity (ICU) shall be minimum of 44KA. The rated service breaking capacity (ICS) and rated short time withstand current (ICW) shall be equal to or greater than ICU.

20 The ACB section of the switch board shall be in separate cubicle separated from other parts of the switch board. This section shall not have any outgoing feeders.

3.2.2 Moulded Case Circuit Breakers

1 Shall have a combination of thermal and magnetic tripping giving an inverse time delay protection against sustained overloads and instantaneous tripping under heavy overloads and short circuits. Unless otherwise stated in the particular specification or drawings, MCCB shall have a minimum short circuit rating of 25 kA.

2 Breakers shall have a quick make, quick break over-centre switching mechanism that is mechanically trip free from the handle so that contacts cannot be held closed against short circuits and abnormal current.

3 Tripping due to overload or short circuits shall be clearly indicated by the handle assuming a position mid-way between the manual ON and OFF position.

4 Latch surfaces shall be polished.

5 Poles shall be constructed to open, close and trip simultaneously.

6 Ampere ratings shall be clearly visible.

7 Breakers shall be completely enclosed in a moulded case to IEC No. 157 - 1A, suitable for installation inside switchboards.

8 Non-interchangeable trip breakers shall have the trip unit sealed.

9 Breakers with earth leakage relay protection shall be provided with shunt trips.

10 Frame sizes shall be as per manufacturer's standard size and as approved by the Engineer.

11 The magnetic trip shall be adjustable type for rating 200 Amp. and above, with 8 settings from 1.5 to 10 times the rated current of the circuit breaker.

12 Each MCCB shall be housed in a separate Compartment with the operating handle door interlocked when used as an Incomer, feeder or motor starter isolator, so that access can only be gained to the Compartment with the MCCB in the OFF position. Padlocking shall be provided in the OFF position only. When the MCCB is used for control transformers, distribution or ICA compartments the handle shall be internally mounted with appropriate shrouding and warning labels.

13 Each MCCB shall be complete with 2 N/O and 2 N/C spare auxiliary contacts (10A, 240v rating) in addition to those required for the Contract.

14 Each MCCB used as an Incomer or feeder shall have facilities for electrical as well as mechanical interlock.

15 All incoming circuit breakers shall be provided with electrical & mechanical interlocking scheme to ensure that only one incoming supply can be energized at any one time where more than one supply is available.

3.2.3 Miniature Circuit Breakers

1 These shall be type C for general purpose uses, suitable for the load they feed, and shall have short circuit rating of 9 kA, unless specified otherwise in the Project Documentation.

2 They shall be fault rated so that fuse backup protection is not required.

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3 They shall be rated in accordance with EN 60898, IEC 898.

4 They shall include the following minimum features:

(a) magnetic and thermal trip elements

(b) trip-free mechanisms

(c) locking of facilities with detachable proprietary brackets and clearly marked ratings.

5 RCBO shall comply with EN 61008-1 & EN 61009-1

3.2.4 MCB/ELCB

1 Combined MCB/ELCB units shall be provided for final circuits supplying socket outlets, water heaters and water pumps.

2 The units shall have a trip sensitivity of 30 mA.

3.2.5 Earth Leakage Circuit Breakers (ELCB)

1 Current operated earth leakage circuit breakers shall provide accident protection by interrupting dangerous contact with voltage which may be present in faulty electrical equipment as a result of frame faults, insufficient insulation or misuse.

2 The ELCB shall also provide high degree of protection against earth leakage, fire and electric shock. It shall withstand at least 10 kA or as specified in the project documents. The breakers shall comply with EN 61008-1 and the recommended specification CEE 227 of the IEC on rules of approval of electrical equipment.

3 The breaker shall consist of a core balance transformer, a tripping coil with contact assembly, main supply contacts, ON/OFF switch, a test button and a trip free mechanism all enclosed in a robust body of all insulated material.

4 Degree of Protection against earth leakage throughout the electrical installation shall be as indicated on the Drawings. Unless otherwise indicated, ELCB shall have 30 mA trip settings.

5 The breaker protecting lighting and or power circuits shall be mounted in the panel board enclosure.

3.2.6 Overload Relays

1 Thermal Overload Relay

(a) thermal overload relay where specified shall be of Bi-metallic inverse time-lag type, which shall 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 EN 60255-8 (EN 60255-149)

(c) the thermal overload relay shall be simple and robust suitable for direct contactor mounting or if to be 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 – 20 Deg C to + 65 Deg C eliminating the need of any calibration in the field during operation.

(e) the thermal overload relay shall provide the following protections:-

(i) over-current/Overload

(ii) single phasing/Phase failure

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(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 starter compartment to reset the relay if so required/specified.

(g) the thermal overload relay shall have two characteristics, the one when the relay bi-metals are in cold state that will break the contacts of the relay within 8-10 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 EN 60947.

(i) thermal overload relays shall be used for motors rating up to and including 11 kW.

2 Electronic Motor Protection Relay

(a) General

(i) the Motor Protection shall be an intelligent electronic device that is user friendly and user configurable, capable of controlling the motor manually or automatic.

(ii) EMPR shall be CE marked and confirm to EN 60947-1

(iii) EMPR with LCD display shall be provided in the MCC for each sewage pump motor starter regardless of the rating of the pump and non-sewage pump drives above 11.0 KW. The LCD unit combined with function keys, minimum IP54, shall be mounted on the cubicle door

(iv) non sewage pump drives upto 11.0 KW inclusive may be provided with ambient compensated bi-metal type thermal overload relay.

(v) EMPR shall have built-in RS485 communication port utilizing Modbus RTU protocol for serial communication with other devices on the network.

(vi) EMPR shall be supplied with software, user manual and interconnecting cables.

(vii) EMPR shall be provided with user friendly software minimum windows 2000 based communication (fully supported by Latest Edition of Windows Based Operating System) program allowing easy access to all features with pull down menus.

(b) the protection features shall include the following as minimum:-

(i) over load protection

(ii) over current protection

(iii) over voltage protection

(iv) under voltage protection

(v) under current protection

(vi) phase sequence

(vii) phase imbalance

(viii) phase loss

(ix) earth leakage

(x) earth fault

(xi) thermistor broken

(xii) open contactor

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(xiii) locked rotor

(c) motor current sensing shall be through external 5 A or 1 A current transformer. The following measured values shall be displayed on the LCD mounted on the starter compartment door.

(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

(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

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

(e) Programmable Ranges

(i) overload – shall be based on the calculation of accumulated I^2t value and selected thermal capacity curve. The tripping time shall be 0-10 Sec. Adjustable.

(ii) locked rotor – To trip the motor within 1 to 5 Sec. when the running current exceeds the stalled rotor trip level of 1.5 to 5.0 x FLC.

(iii) 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 prolonged for 10 seconds or more a trip shall occurs.

(iv) earth fault – The earth 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 x 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.

(v) thermistor/over temperature – 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.

(vi) under current – 10 – 100% of motor FLC with a time delay of 0-30 seconds.

3.2.7 Fuses

1 These shall be selected according to the application and be suitable for the type of load they feed, for example motor starting, cable protection, protection for the semi conductor devices, control transformer protection etc.

2 Fuses shall be sized according to the condition under which they will operate such as normal, small sustained overload, heavy overload etc. in order to consider the operating characteristics accordingly.

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3 The fuse shall either include a suitable fuse carrier or it shall be capable of isolation. If the fuse carrier is included it shall be such that when it is being withdrawn normally or when it is completely withdrawn the operator is completely protected from accidental contact with any live metal of its fuse link, fuse contacts and fixed contacts.

4 Fuse/links shall be fixed inside cubicles with sufficient spacing to facilitate easy fuse/link withdrawal.

5 If the fuse is capable of isolation it shall be so interlocked with the switch that isolation is complete before the fuse enclosure can be opened further. The switch shall be prevented from closing while the fuse-cover is open.

6 All fuses shall be of HBC/HRC cartridge type to BS 88/ EN 60269.

7 Fuse holders and fittings shall be made of molded plastic insulating material of an approved make. Ceramic materials will not be accepted. Fuse fittings shall be fully shrouded and it shall be possible to change the fuses without danger of contact with live metal. Fuse holder terminals shall be of the clamp type where the screw does not directly tighten onto the conductor.

8 Fuse fittings shall have basic sizes of 16, 32, 63, 100 and 200A and the fuse holders shall be able to accept fuse links of that rating on any BS rating down to the next basic size.

9 A mechanical indication device shall be built into the fuse to indicate operation/fail status.

10 All small wiring for voltmeters etc. from the busbars shall be via busbar mounted fuse holders containing 20 amp fuse links. The fuse holders shall be solidly bolted to the busbars.

3.2.8 Fuse Switches

1 Fuse switches where specified shall comprise flush/surface mounted heavy duty composite air break switches and fuse units complying with EN 60947-3 and fitted with fuses to EN 60269 and shall be rated and equipped as detailed. Composite units shall be contained within an enclosure of metal and shall be fitted with an earthing terminal or equivalent to enable the enclosures to be earthed irrespective of any means of connection such as is provided for attaching armoring or other metallic covering of the cable supplying the composite unit.

2 Fuse switch shall be capable of making, carrying and breaking current under normal circuit condition, which may include specified operating overload conditions and also carrying for specified time currents under specified circuit conditions such as those of short circuit.

3 The switch breaking capacity shall be related to AC 23 utilization category or other approved equivalent standard for 415 V 3 phase 50 Hz 4 wire operation for use on specified fault level and for service and site climatic conditions as described in section 16480 Factory Built Assembly (FBA).

4 EN 60269 complied HRC fuses shall be provided as a mean of overcurrent/overload protective device to protect the switch. The maximum rated current of the fuse with regard to the prospective short circuit current in the actual circuit shall be mentioned.

5 The fuse shall be connected after the switch so that a short circuit will not occur in the fuse-combination, thus for an expected fault to take place after the combination fuse switch unit

6 In the event of a fault this combination shall provide protection, permitting switching without, for example contact welding and preventing separation of main contacts in case of fault occurring during running.

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7 The combination fuse switch unit shall be housed in an enclosure so constructed that the cover cannot be opened until the switch is fully opened and the construction shall be such that when the cover is opened a competent examiner can override the interlock and operate the switch. After such operation the cover shall be prevented from closing with the switch position indicator in a false position.

8 Switches shall be provided with mechanical ON/OFF indicators and operating handles.

9 Means shall be provided for locking the switch in the OFF position only.

10 The combination fuse switch unit shall be fitted with 2NO + 2 NC auxiliary contacts wired to the terminals.

3.2.9 Isolating Switches

1 The switch when used alone as explained above as an Isolator shall confirm to the utilization category AC23 and shall fully comply with the requirement specified for isolating functions specially the isolating distance in accordance with the applicable standard.

2 An Isolator shall be capable of opening and closing the circuit ON-LOAD with full voltage applied across the terminals.

3 The Isolator shall be capable of carrying currents under normal circuit conditions and carrying for specified time currents under abnormal conditions such as those of short-circuit.

4 All other features of the Isolator shall be same as specified above for combination fuse switch unit.

3.2.10 Stop Lock-off Push Buttons

1 Stop lock-off push buttons for motors shall be the mushroom headed red stay-put type with automatic latching, the units having to be key operated to be released.

2 Push buttons shall be housed in a surface mounting weatherproof enclosure to IP 65.

3 Push buttons shall be UV stabilised.

3.2.11 Control Relays/Auxiliary Relays/Interposing Relays

1 All auxiliary relays shall mainly comply with EN 116000 and EN 116205-7.

2 Where similar relays have different operating voltages and/or different contact configurations, they shall be non-interchangeable.

3 Voltage at nominal operating temperature and shall not ‘drop-out’ at greater than 60 % of the nominal coil voltage.

4 Relays shall be continuously rated and capable of sustaining a voltage 10 % in excess of the nominal coil voltage.

5 Relays shall be fully encapsulated and be of the plug-in type, with terminals protected to a minimum of IP2X.

6 Plug-in relays shall be fitted with transparent dust-proof covers. External connections shall be screw clamp terminals, which are easily accessible with the relay in position.

7 Relays shall include the provision for manual operation.

8 The pin configuration of the relay shall be printed on the casing and on the bases in order to ensure correct pin alignment.

9 Relays shall be suitable for operation at plus 10% and minus 20% of their nominal rated voltage.

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10 The contacts configuration shall be either normally open/normally closed or changeover contact combinations.

11 The contact material used in the Relay for general logic design shall be AgCdO. Specific applications requiring extra low switching current shall have GOLD Flash contacts for minimal voltage drop across the contacts.

12 It will not be permitted to use mixed voltages on the different contacts of a particular relay. If necessary additional relays shall be used by employing good engineering practices such as operation of add-on relay through auxiliary contact of main relay.

13 Relays Coil shall be vacuum impregnated ensuring satisfactorily operation for the adverse climatic conditions as specified.

14 The relays shall be mounted on DIN Rail.

15 Relays shall be secured to their bases by retaining bar or clip to prevent malfunction due to the relay being loosened in its base.

16 Care shall be taken to ensure that relay contacts and associated wiring are suitably fused protected.

17 All type of relays shall have a means of visual indication e.g. light emitting diode (LED) or neon bulb mounted within their clear covers connected directly across the relay coil to indicate when the relay is energized. These indicators shall be easily seen when the relay compartment door is opened.

18 A permanent means of identification shall be affixed to both relay and base in line with the circuit diagram reference.

19 Where remote supply voltages are used, a warning label engraved in English and Arabic shall be fitted, clearly identifying the source of supply.

20 The relay shall be designed for minimum 1 Million mechanical operation and 200,000+ electrical operations at rated load.

3.2.12 Protection Relays

1 Protection relays shall comply with EN 60225-6, EN 61810-1, IEC 255.

2 Secondary injection shall be easily possible by means of purpose-made voltage and/or current plug-in type test terminal blocks which automatically open circuit or short circuit the integral voltage transformers or current transformers respectively and provide termination's for the test supply. Disconnection of any permanent wiring will not be acceptable.

3.2.13 CHANGEOVER SWITCH

a) A changeover switch, where specified, shall be provided in accordance with EN 60947-3. It shall be manually operated multipole type suitable to provide changeover and safety isolation between two low voltage power supply.
b) The switch breaking capacity shall be related to AC 23 utilization category or other approved equivalent standard for QGEWC rated voltage.
c) The changeover switch shall be periodically maintained to ensure proper operation and system reliability.

3.2.14 Alarm System

1 Auxiliary relays and auxiliary contacts and circuit breakers shall be provided as necessary and if indicated to transmit alarm signals to remote control buildings.

2 Alarms shall be as indicated on the Contract Drawings and shall be selected from:

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(a) circuit breaker tripped

(b) power failure

(c) standby generator failed-to-start.

3.2.15 Padlocks

1 Padlocks shall be provided for all handle operated circuit breakers, fuse-switches, isolators and the like.

2 Padlocks and keys shall be housed inside a safety key box located in the relevant electrical switch rooms, including padlocks and keys for lockable field equipment supplied from the switch-room.

3 Safety key boxes shall also be lockable using a master key.

3.2.16 Hours Run Meters

1 There shall be two counters provided for each motor. The one counter shall be non-resettable hour run meter, rotating disc type for measuring total operating period (accumulative) of a motor. The minimum size shall be 48 x 48 mm. The counting capacity shall be 99,999.99 hours. The color of the decimal digits shall be red while the color of other digits shall be white.

2 The second counter shall be provided for counting total (accumulative) number of start of motors 75kW and above. This shall be non-resettable, electronic type with permanent memory retention arrangement and LCD display to indicate Number of start of a motor.

3.2.17 Thermistor relay

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

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

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

4 Thermistors shall be designed to include the following features:-

(a) tamperproof

(b) rapid responding

(c) UL/CSA recognized component

(d) eliminates nuisance trips

(e) field-proven Klixon design

(f) requiring no field adjustment

(g) allows full use of motor rating

(h) directly senses winding over-heating

5 Thermistors shall protect the motor against the following conditions:-

(a) locked rotor

(b) running overload

(c) single phasing

(d) voltage unbalance

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(e) high motor ambient temperature

(f) blocked ventilation

6 Thermistors have to be connected to a separate control unit that enables tripping of the motor through the starter contactor upon change of resistance of elements in the thermistor circuit beyond pre-determined value.

7 The wiring of the relay module shall be so done, that inhibit the starting of the pumps automatically even after the temperature limit sensors have cooled and reclosed the circuit. The facility shall be provided in the motor control centre to reset the control circuit manually, ensuring that a proper cause of overheating has been determined and corrected prior to the restart of the pumps in auto mode.

8 Additional to the sensing of winding temperature by the thermistor, means shall be provided to monitor the bearing temperature wherever possible and as recommended by the motor manufacturer.

3.2.18 Moisture and mechanical seal leakage protection

1 All submersible sewage pump motors shall be provided with a dedicated moisture and mechanical seal leakage protection relay.

2 The moisture sensing probes extended into the oil chamber located between the lower (outer) and upper (inner) seals to detect the presence of moisture in case of failure of outer seal.

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

4 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.

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

3.2.19 Timers

1 Timers shall be plug-in or surface-mounting types; solid state microprocessor based employing CMOS IC technology.

2 Timers shall be suitable for operation on a nominal 240 V AC, 110V AC, 24 V AC/DC or other voltage as specified or deemed necessary for the safe operation.

3 Timers shall have linearly calibrated scales, in units of time, each scale division being a maximum of 5% of full scale. Repeat accuracy shall be within 0.5% of full scale.

4 Timers shall be provided with “energized” and “timed out” indicators.

5 Plug-in timers shall be fitted with transparent dust-proof covers. External connections shall be screw clamp terminals which are easily accessible with the timer in position

6 Timers shall be secured to their bases by retaining bar or clip to prevent malfunction due to the relay being loosened in its base.

7 The pin configuration shall be printed on the casing of the timer and on its associated bases in order to ensure correct pin alignment.

8 Timer shall be provided with 10 Amps. Rated output relay with DPDT contacts.

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مواصفات قطر للإنشاء
Qatar Construction Specifications

9 Unless specified otherwise, timers shall be provided for circuits that require delay on operate, delay on release, and star-delta starting of a 3-phase induction motor.

10 Multifunction timing relay programmable where specified shall be provided to the satisfaction of the engineer.

11 The use of pneumatic timers, motor driven timers and other special timers shall be avoided unless specifically mentioned in the particular requirements and the same shall be subjected to the review and approval by the engineer.

END OF PART

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