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TECHNICAL SPECIFICATIONS FOR BOILER MCC PANEL

Rev	Date	Description of Revisions	Status	Ppd	Ckd	Appd	PM	Ppd	Mech	Elec	C&I	Civil	QA	Appd

OWNER	M/s. Harinagar Sugar Mills Ltd., Bihar.
CONSULTANT	
PROJECT	1 X 35 TPH Pulsating Grate Boiler
EPC	M/s.Uttam Energy Limited, Pune.

CONTENTS

1. 1. CODES AND STANDARDS

Work included in this specification shall confirm to the applicable IS/IEC/EN standards as listed below…

IS: 4237	General requirement of switchgear and control gear for voltages not exceeding 1000V
IS: 2147/IEC60529	Degree of protection provided by enclosures for low voltage switchgear and control gear.
IS: 375	Marking and arrangement of bus bars (Applicable for compartmentalized panels)
IEC/EN: 60947-2	Specification for Moulded case circuit breaker
IEC: 60898/IS: 8828	Specification for Miniature circuit breaker
IEC: 60947-2/IS: 13947-2	Specification for Air circuit breakers
IEC: 60947-3	Specification for Load break switches
IEC: 60269-2/IS: 13703	Specification for HRC fuse link
IEC: 60947/IS: 13947	Specification for electromechanical contactors
IEC: 60947/IS: 13947	Specification for Motor Protection circuit breaker.
IEC/EN: 60947-5-1	Specification for Control switches, Push buttons and Lamps
IEC: 60947-3/IS: 13947	Specification for Rotary switches
IEC: 60947-7	Specification for Terminals blocks
IS: 694	Specification for PVC Insulated flexible cables for working voltage up to and including 1100V AC or 1200V DC

2. 2. SYSTEM DESIGN PARAMETERS

Max. Ambient temperature : 50 Deg Cel.
Relative Humidity : 85 max, 20 min, 60(Design)
Power Supply : 415 V ±10%
Control Voltage : 230 V ±10%
Frequency : 50 Hz ±5%

3. CONSTRUCTION OF PANEL :

1. Panel shall be free standing floor mounted mounted, dust and vermin proof, cubicle type suitable for indoor application having **IP-52** class of protection.
2. Panel shall be single front accessible non draw out **Compartmentalized** Type.
3. All units shall be housed in separate sheet steel enclosures to provide at least Form 3B type segregation.
4. Panel operating height of feeders shall be 400mm to 1800mm.
5. Panel shall be fabricated from **CRCA mild steel sheet**. Thickness for load bearing and non-load bearing part & doors shall be minimum 2 mm. Partition plate and panel back covers shall be of 1.6 mm
6. Unless and otherwise specified cable entry shall be from bottom. Undrilled detachable gland plates shall be provided at the bottom of the panel. Thickness of gland panel shall be 3 mm .
7. The cable alleys shall be on working front of the MCC & min. size shall be 300 mm, the vertical busbar shall be on rear side.
8. Panel shall be mounted on 75 mm ISMC channel frame.
9. All accessible doors shall be provided with concealed hinges. Back side doors shall be bolted type.
10. All doors shall be fitted with individual locks.
11. Minimum clearance of 50 mm to be allowed between the side of the panel and the nearest component. .
12. Minimum of 50 mm clearance shall be provided between back side of door mounted instruments, including wires of instrument, and components mounted on base plate.
13. Maximum door section width including frame shall not exceed 800 mm.

14. Maximum height of panel including base frame shall not exceed 2375 mm.
15. The joints of plates and doors shall be suitably packed using weather proof neoprene or equivalent type of gasket (Not rubber). U type rubber gasket may be used for gland plate sealing.
16. Sharp edges or corners are not allowed and all exposed screws, bolts and other fixings must be rounded or polished to remove sharp edges.
17. All cut outs should be accurate and true, edges are to be deburred and painted.
18. Minimum of 200 to 300 mm of space, between gland plate and terminal strip, shall be available at the bottom of panel for proper field cable termination.For incomer min.space should be 500 mm from glad plate.
19. Removable lifting eye bolts/angle frame shall be provided for panel loading/unloading. Lifting hooks shall be Zink plated and angle frame shall be black coloured. Vendor to ensure sufficient number of eye bolt or properly designed angle frame to carry the panel load.
20. MCC panel Shall be suitable for being extended on both sides.
21. MCC panel shall have a common marshalling compartment.

3. 4. PAINTING

1. Prior to powder coating, all surfaces shall be degreased and de rusted with 7 tank treatments.
2. All internal and external surfaces shall be free of all marks/scratches and irregularities.
3. Painted surfaces shall be uniform and free of runs.
4. External/internal surfaces are to be **powder coated** with **Siemens Gray RAL 7035**. Component mounting plate shall be of **Orange RAL2000**.
5. Minimum thickness of paint shall be **70microns**.

4.1. BUS BARS:

- The main Bus-bar shall be of Electrolytic grade Aluminium (EC-91 E-grade) & mounted on the top of the MCC & supported on Epoxy / SMC/ FPP type insulators at equal interval. The system shall be suitable for 3P, 4W, 415V AC, 50Hz, 50 kA for 1sec. The panel shall be designed by considering the ambient temperature 50 deg C. & final working temperature of bus bars shall be 85 deg C. Max.current density should be 0.8 A / sq.mm.
- The min size of the vertical busbar shall be max. of the connected load on the vertical bus bar & min.size required for short circuit capacity of 50 kA for 1 sec. R. Y.B color sleeve shall be provided for main & vertical busbar.

4.2) SWITCHGEAR COMPONENT :

The switchgear selection shall be as per type – 2 co ordination chart, In case of S/D starter the contactors Star, Delta & main shall be same size. For the motor feeders having higher accelaration time (more than 6 sec.), component selection should be separately taken from switchger manufacturer.

Incomer:- Incomer shall have SDF with fuse upto 800A and manually draw out type ACB above 800 A rating. Incomer shall have Ammeter + ASS, Voltmeter + VSS, 3 nos cast resin CTs , R. Y. B indication lamps , Digital type kWH meter and control fuses. ACB shall be provided with numerical release having O/C, S/C & E/F protections.

- **DOL Feeder**:- DOL up to 30 KW shall have SDF with HRC fuse, aux contact of SDF, bimetallic overload relay, Power contactor, ON, OFF, Trip Indication lamps, latch able stop button,DP MCB for control supply, Ammeter direct reading up to 5.5 kW & above 5.5 kW up to 30 kW- C.T operated Ammeter with 1 No C.T (In Y phase - tape wound).Above 30 kW - 3 C.Ts(Tape wound) Ammeter with ASS to be provided.DOL starters shall be suitable for operating from PB station near motor.

- **S/D Feeder :-** S/D motor feeder SDF With HRC fuse , aux contact of SDF, 3 nos. Power contactors of same rating,Bi metal relay (as per the application check up with switchgear vendor - heavy duty) up to 55 kW & above 55 kW Static relay (class of relay to be decided based on the acceleration time of the motor) shall be provided.3 Nos. CTs (Tape wound), DP MCB for control supply Ammeter with ASS, ON, OFF TRIP indication lamps, latchable stop P.B, S/D Timer. Star delta starters shall be suitable for operating from MCC & PB station near motor.

- **Capacitor feeder**: - Capacitor feeder shall have SDF with HRC fuse, Power contactor (capacitor duty) ON delay Timer, ON, OFF Push button, ON, OFF indication lamp,C.T (1No.) ,Ammeter, DP MCB for control supply.

- **Supply feeder for VFD panels:** The feeder shall have SDF with HRC fuses,3 nos. CTs, Ammeter + ASS, On/ Off indication lamps, DP MCB for control supply.

- **Control Transformer Feeder**: MCC shall have 2 Nos. control Transformer with auto changeover arrangement. The control voltage shall be 230 V AC.

- Motors feeders of rating 30 kW & above shall have provision of circuitary for space heaters supply.
- **Plug socket Feeder: -** SDF, HRC fuses , Plug socket, ON indication lamp, DP MCB for control supply.

Spare feeder: - to be provided as per the feeder list given eleswhere.

Control / Power wiring: PVC stranded copper wire of size 1.5 sq.mm shall be utilized for control wiring & for CT , 2.5 sq.mm Cu stranded wires shall be used.

MOV DISTRUBUTION BOARD FOR OUTDOOR INSTALLATION REFER ET – MOV

4. 5. WIRING (APPLICABLE FOR MCC PANEL, STANDALONE VFD PANELS, MOV DISTRIBUTION BOARD)

4.1. 5.1. GENERAL

1. All cables used inside the MCC panel shall be of PVC insulated 1100V grade.
2. Only multistrand flexible copper cables shall be used inside MCC panel.
3. Screened cable shall be used for analog signals (4-20mA, RTD, flame sensor, feedback potentiometers etc). The screening must be connected to the earth at one end.
4. All wiring shall be carried on the front surface of the mounting plate, in PVC cable ducts/channel of the ventilated type with clip-on covers.
5. Interconnecting wiring between base plate components and door instruments shall be enclosed in spiral binding.
6. All PVC ducts used shall be of a fire resistant, self-extinguishing type.
7. Wiring outside the ducts shall be neatly set for connection to terminals or components.
8. When large wiring looms are carried on a door/switch section a mechanical fixing device must be used; self-adhesive devices may only be used on small looms up to 10 cables.
9. No more than 30 conductors shall be in any one loom. There shall be sufficient space inside duct to accommodate minimum of 10 spare cables to run.
10. Pin type lugs shall be used to terminate the cables in terminals. Fork type lugs shall be used for instruments, etc.
11. Lugs shall be of properly tinned copper material.
12. When panels are manufactured in sections, each such section shall be supplied with fully numbered interconnecting terminals for wiring between sections on site after they have been positioned.
13. All control transformers shall be of double wound type.

4.2. 5.2. LOW VOLTAGE A.C./D.C. CABLES

(Normally not exceeding 1000 volts between conductors or 600 volts between conductors and earth)

1. To be PVC insulated, copper cables, flexible multistranded as per IS694**.**
2. To have a minimum conductor size of 2.5 sq. mm on all power circuits and 1 sq. mm on A.C. control circuits (From mains /control transformer up to distribution TB 2.5/4/6 sq. mm. cable, as per control circuit current shall be used.). For 24VDC circuits min. 0.5 sqmm cable shall be used.
3. For 3-phase wiring colours shall be red, yellow and blue and black for neutral.
4. Cables larger than 6 sqmm can be a single colour with phase colour identification heat shrinkable(R, Y, B) sleeves at ends. **Insulation tape is not acceptable**.
5. To be in gray and black for single phase 220VAC panel circuits.
6. To be in orange/white colored for 24VDC +ve and –ve wire respectively.

4.3. 5.3. SIGNAL/SCREEN CABLES

1. To be insulated, copper cables, flexible multistranded, **screened**.
2. To have minimum conductor size of 0.5 sqmm.
3. To be in brown/white colour for +ve and –ve wires.

5. 6. TERMINATIONS

1. All outgoing electrical cables to be terminated in a terminal strip at the top/bottom/cable chamber of the panel.
2. The smallest terminal must be capable of accepting a 2.5sqmm conductor cable.
3. Minimum 6 sq mm clip on type screw terminals for power and minimum 2.5 sq mm clip on type screw terminal made from poly amide 6.6 shall be used.
4. For outgoing cables of 30 kW and above rated feeders , busbar/bolted type power terminals shall be used.
5. Terminal strip shall be fully numbered in consecutive order form left to right or top to bottom in conjunction with the wiring diagram and fitted so that extra units may be added.
6. Numbering terminal markers shall be half round or ‘K’ type.
7. Sufficient terminal rail to be allowed to fit an additional 5% terminals.
8. Terminal strip, group of terminals, shall be supported with end plate and end clamp.

9. For all cables, internal wiring to starters, contactors, instruments or any associated equipment including terminal blocks, maximum of two cables per terminal are allowed. All wiring to be terminated by a pre-insulated crimp type lugs, using a pre-determined crimping tool. Where insulated terminals are not used/applicable lugs shall be covered with heat shrinkable sleeves. Where ever possible, shorting links/cross connection link assembly shall be used, looping of consecutive terminals with wire shall not be done.

10. All cables shall be permanently designated at each and every termination in accordance with the wiring diagram. The marking of each cable shall be by means of sleeve type ferrule of the correct size for the cable, with designation in black letters printed on a white background sleeve .

11. There shall not be looping of three phase supply for one feeder from another feeder. All feeders' incoming cables shall be driven independently from incomer or using distribution terminal blocks.

12. When current transformers (CT) are provided, CT short links shall be provided to isolate the current measuring instruments/selector switch.

13. Bolt/eye type terminals on SDFand contactors shall be with suitable washers. There shall not be air gap between lugs and bolt.

14. Group of terminals shall be identified by group marker.

15. Danger electricity symbol shall be provided at incoming supply of MCC panel.

16. All mounting din rails shall be Zink plated. Rails shall be fixed to mounting plate by screw, riveting is not permitted.

17. Rails provided to terminate field power cables shall be properly supported at regular intervals.

18. For instruments which will be fitted on site, vendor shall do the wiring as per wiring diagram. Wires shall be terminated near instrument location. Sufficient wire length shall be provided.

6. 7. EARTHING (APPLICABLE FOR MCC, STANDALONE VFD PANELS, MOV DISTRIBUTION BOARD)

1. Power earth bus shall run throughout the length of panel with two numbers M12 size brass earth bolts on either side of panel.
2. For VFD, separate earth wire shall run from VFD earth point to power earth bus bar.
3. All earth connections to power or instrument earth bus shall be of screw type.
4. Following shall be connected to power earth
    - Panel accessible parts like body, mounting plate, panel doors etc.
    - Shield of transformer
    - Earth terminal of all field power supplied.
    - Utility sockets

8. MAINS INCOMER ACB/SDF

1. Incomer shall be 1600 A MDO 3 pole ACB & neutral bus bar shall be be provided with isolation link.
2. Main incoming ACB,if provided, shall be mounted on bracket.
3. For incomer SDF having current rating more than 250A, busbars shall be provided for termination of panel incoming cables. Similarly busbars shall be provided at the outlet of SDF for distribution of power for various feeders.
4. For SDF having current rating < 250 A, bus bars to be used to terminate incoming cables.Bus bars can be supported on Z clamps.
5. Length of incoming busbars shall be minimum 150 mm from bottom of SDF. Busbars shall be properly supported with insulators.
6. Spacing between the two busbar shall be minimum 25 mm. Isolation plates shall be used at the inlet and outlet of MCCB while providing the busbars.
7. All busbars shall be covered with acrylic sheet to avoid accidental touch to live busbars.
8. Supply of phase indicating lamps with MCB shall be tapped from incoming side of busbar.Indicating lamps shall be provided on the outgoing side of Incomer.
9. Incomer shall be provided with voltmeter and ammeter with selector switches.Voltmeter + VSS shall be provided on incoming side of the incomer.
10. When CTs are used, CTs shall have class 1.0 accuracy and VA burden shall be as per the load requirement. CTs shall comply to IS: 2705.
11. Current rating of CT and ammeter shall be 5A.

7. 9. LABELLING

1. All instruments,lamps,switches mounted on panel door shall be clearly labeled for their function. These shall be aluminum engraved/laser printed labeles.

2. All components mounted on base plate shall have adhesive tags pasted on each component. Similar label shall be provided on base plate near the component, to identify the component location, when it is removed for replacement or repair.

8. 10. GENERAL

1. Make of all the components shall be as per approved vendor list given with specification.

2. When connecting feeder cables to bus-bars, the connections are to be shrouded and colour coded.

3. Components mounted within the panel are to be screwed into tapped holes on the back mounting plate or to be rail mounted. Self-tapping fixings/riveting are not permitted.

4. Shrouding of all exposed/open equipment must be carried out. Acrylic sheets can be used.

5. Danger electricity symbol ("Caution, risk of electric shock") shall be pasted on acrylic sheets, on panel door near mains incomer, busbar chambers and on all shrouds of exposed/open parts.

6. A document/drawing pocket is to be provided within the panel, for circuit diagrams and other relevant drawings. An as built set shall be provided with the panel.

7. Fuse puller shall be provided where ever applicable.

8. Switches, push buttons and lamps shall have finger touch protected screw terminals.

9. Lamps shall be cluster LED type.

10. Lamp colour indication shall be Red for ON, Green for OFF indication, Amber for trip indication. Other colours shall be used as specified in electrical wiring diagram.

11. Illumination tube light or CFL and space heater shall be provided, in all cable chamber and marshalling chamber.

12. Where ever applicable utility socket of min. 5A current capacity shall be provided. When the panel is supplied to other country then same shall be euro type.

13. Spare holes provided on doors for lamps/switches shall be closed with hole blanker/ grommet.

14. Bakelite sheet shall be provided in between MCCB/ACB and mounting plate, for MCCB having current rating 250A and above.

15. All hardware used in panel shall be of MS Zink plated.

16. Mounting plate shall be firmly fitted to main panel body with sufficient number of nut bolts. Vendor to ensure, during transportation mounting plate or components mounted on plate shall not be loosen.

VFD STANDALONE PANELS & WITH STAR-DELTA BYPASS :

BFWP/ID/FD/Bagasse Drum Extractor Feeder/Pocket Feeder shall be provided with VFD

VFD shall have SFU with semiconductor fuse (as recommended by drive manufacturer). VFD feeder shall have Digital RPM meter,Digital Ammeter, latchable stop button, Drive ON, OFF, Trip indication LED lamp. VFD starters shall be suitable for operating from DCS panel & LPBS station near motor.

Drive shall be digital and non regenerative type .
The drive shall be suitable for 50 deg. Ambient temperature and voltage variation ± 10%

Frequency variation ± 5%. The drive shall be of IGBT based with necessary filters/ chokes to compensate for reflected wave phenomenon and shall be properly selected for the cable distance of approximately 150 mtrs. The continuous current rating of VFD shall be at least 110% of respective connected motor FLC. The drive shall have modbus communication port.The drive shall be provided with suitably sized switch fuse unit at input side. The panel for accommodating the drive and other components and shall have IP– 42 protection.The panel shall be stand alone and the height shall be max. 2000mm for all the feeders.

Fan and louvers shall be provided to prevent overheating of panel in normal ambient temperatures. Louvers shall be removable type to clean and change the filter pads.

For all VFDs keypad shall be mounted on the panel door. Suitable communication cable shall be provided between VFD and keypad.

9. 11. MCC /VFD FEEDER

MCC panel shall have provision for starters of following motors.

Sr. No.	Description	Load Type	Motor KW	Quantity	Starter Type
1	Feed Water Pump-1&2	W	160	2	3Ph Supply Feeder
2	Feed Water Transfer Pump	W	18.5	2	DOL
3	FD Fan	W	75	1	3Ph Supply Feeder
4	PS Fan	W	45	1	Star-Delta
5	SA Fan	W	110	1	Star-Delta
6	ID Fan	W	200	1	3Ph Supply Feeder
7	Bagasse Drum Extractor	W	16.5	1	63 Amp 3Ph Supply Feeder
8	HP Dosing Pump- 1&2	W	0.75	2	DOL
9	LP Dosing Pump- 1&2	W	0.37	2	DOL
10	HP Dosing Strier Tank	W	0.37	1	DOL
11	LP Dosing Strier Tank	W	0.37	1	DOL
12	Hydraulic Power Pack	W	7.5	1	DOL
13	Rotary Soot Blower	W	0.37	3	DOL
14	Long Retractable Soot Blower	W	1.1	2	RDOL
15	DCS UPS Supply	W	10	3	32 A 3Ph Supply Feeder
16	Instrument Air Compressor - 1&2	W	37	2	125 A 3Ph Supply Feeder
17	Capacitor Bank	W	100 kVAR	1	2 nos. 50 kVAR Capacitor Banks will be required.
18	Combustion Air Fan For BMS	W	15	1	DOL
19	Motorised Valve Distribution Board	W	-	2	32 A 3Ph Supply Feeder With 16Amp TP MCB ,8 Nos each panel
20	Submerged Ash Belt Conveyor	W	3.7	1	DOL
21	Silo Extraction Power Cum Local Control Panel	W	12.6	1	32 A 3Ph Supply Feeder
22	Supply Feeder To AHS PLC Based Mimic Panel	W	-	-	16 A 1Ph Supply Feeder
23	PDC RAV	W	0.75	2	DOL
24	Screw Feeder-1 to 3 Bagasse	W	5.5	3	DOL
25	Screw/ Pocket/ RAV Feeder-1 to 3 Rice Husk	W	6.6	1	63 A 3 Ph Supply Feeder
26	Pocket/RAV Feeder-1 to 3 Rice Husk	W	2.2	3	DOL
27	Supply Feeder For ESP MCC	W	150	1	-
28	Burner Local Panel	W	-	-	32 A 3Ph Supply Feeder
29	Control Transformer	S			
30	Spare Feeder 1	S	30	1	DOL
31	Spare Feeder 2	S	0.37	1	DOL
32	Spare Feeder 3	S	1.5		DOL
33	Spare Feeder 4	S	-	-	32 A 3Ph Supply Feeder
34	Spare Feeder 5	S	-	-	63 A 3 Ph Supply Feeder
35	Spare Feeder 6	S	-	-	63 A Plug Socket
36	Air Receiver ADV	W	-	2	2 A MCB 2nos
37	Air Dryer supply	W	-	2	6 A MCB 2nos
38	Spare	S	-	2	10 A MCB 2nos

W = Working Duty , S= Standby Duty

Note : 1)There could be minor change in motor KW ratings. Same will be informed during detailing.
2) Fuseless type-2 cordinated switchgear shall be provided for all motor feeders.

STANDALONE VFD+STAR-DELTA BYPASS SEPRATAE PANEL:

- FEED WATER PUMP-1&2 -SEPARATE PANEL FOR 2 NOS. 160 KW MOTORS. PANEL WILL HAVE 2 NOS. SEPARATE *PANEL FEEDER.*
- FD Fan - Separate panel for 1 No. 75 kw motors. Panel will have 1 Nos. Separate Incomer feeder.
- ID Fan - Separate panel for 1No. 200 kw motors. Panel will have 1No. Separate feeder.

STANDALONE VFD SEPRATAE PANEL:

- Bagasse Drum Extractor feeder -Common panel for 3 Nos. 7.5 kW motors. Panel will have 1 no. Common Incomer feeder.
- Screw Feeder-Common panel for 3 Nos. 2.2kW motors. Panel will have 1 no. Common Incomer feeder.

Following controls shall be made available in the drive:

- HIGH INPUT LINE SIDE POWER FACTOR THROUGHOUT THE SPEED RANGE.
- Low harmonics on input line side with the total and individual harmonic contents not exceeding the limits established in IEEE519.
- Continuous setting for speeds from lower to rated speed.
- Continuously adjustable acceleration and deceleration times.
- Motor Voltage.
- Torque boosting.
- Flying Start & kinetic buffering facility
- Cooling fan start/stop logic
- Power loss ride through mode/Kinetic Buffering.

Drives shall have the following protections for the motor/drive:

- Over Current & thermal overload protection – 49
- Under and Over Voltage – 59/27
- Earth Fault in Motor of cable
- Motor stalled rotor protection during starting and onload – 51
- Motor overload.
- Motor Under load.
- Drive over temperature.
- Short circuit.
- Single phasing prevention.
- Motor current unbalance protection – 46.
- DC ripple voltage, with provision for adjusting the setting.

- Surge.
- Instantaneous over current.
- Phase sequence.
- Panel temperature "high".
- Heat sink temperature "high".
- Any other motor or drive protection as required depending on the particular application

The drive shall have a detachable alphanumeric display control unit, with diagnostic feature and indications in natural language along with error code, which can be mounted separately on front of the drive module door.

It shall be possible to adjust the speed setting reference either from the control panel or local mode.
The following indication lamps, of LED cluster type, shall be made available at the panel:

- Motor ON
- Motor OFF
- VFD trip
- Control supply On
- Inverter Fault.

External indicating meters shall be made available for the following functions:

- Motors speed indication
- Ammeter

Signal isolators to be provided to obtain galvanically isolated output signals (4 – 20) mA to be made available for all the drives.

- Drive Speed.
- kW signal from drives.

Potential free contacts (2No. + 2 NC) for the above selections through auxiliary contactors shall be arranged at marshalling compartment, within the panel in a separate compartment for hooking-up to the control panel.

The drive panel shall be provided with 10 points microprocessor based temperature scanner for motor winding and bearing temperature, BFWP DE-NDE temperature. Motor space heater connection is to be provided.

MCC FEEDER CONTROL SCHEME

All above boiler feeders shall be controlled either from DCS or LCS. Remote/local selection shall be done from the switch provided on MCC panel door. Each motor shall have individual Remote/local selection switch. Remote/local switch shall have key locking facility. It shall be possible to select local mode only when key is put in the switch. It is possible to start a motor from local station if it is in local mode. However always it is possible to stop a motor from local station.

Each motor shall have On(Green) and Trip (Amber) indicating lamp mounted on panel door.

Each motor shall have following signals available at terminal strip for interface with PLC panel.

A. Digital inputs : Motor Run and Trip (To DCS panel)
B. Digital outputs : Local Permissive/Start/Stop (From DCS panel)
C. Analog Input : VFD speed reference feedback, current Feedback (To DCS panel)
D. Analog Output : Speed reference (From DCS panel)

All TB should be colour codes as mentioned below :

A. Digital Input : Blue colour TB
B. Digital Output : Blue colour TB
C. Analog Input : Yellow Colour TB
D. Analog Output :Green Colour TB
E. Other Control : Gray Colour TB
F. Power Terminal : RED, Yellow, Blue
G. Earthing : Yellow/Green

As far as possible all signals interfaced with DCS shall be grouped together on a common terminal strip.

10. 13. MCC PANEL TESTING AND ISPECTION

1. Wherever applicable, all instruments/components shall be factory tested for operation and calibration.
2. Panel vendor shall arrange for simulation test jigs.
3. All power and control wires shall be insulation tested to ground with 500 volt megger.
4. For power circuit in for MCC panel high voltage test of 2.5KV for 1 minute and megger test with 500V shall be carried out. Megger test shall be carried out before and after the high voltage test.
5. Purchasers representative shall attend the control panel FAT.
6. All control, instrumentation and power devices and circuits shall be checked for function as per the approved electrical wiring diagram. Parameters of all controllers, VFDs shall be verified as per the electrical drawings.
7. Where functional check of circuit is not possible, same circuit shall be tested for continuity as per the electrical wiring diagram.

8. End user reserves right for control panel FAT witness. Hence when asked, panel vendor shall submit for engineer's approval, a procedure outlining various steps involved in carrying out FAT. The procedure shall include detailed methodology on how various tests shall be carried out. Vendor shall arrange for electricity and space required for control panel testing.

11. ***14. DOCUMENTATION***

Vendor shall supply following as built documents, before dispatch of control panel in two sets of hard copy and one electronic copy written on CD. As built drawings shall be provided representing the successful commissioning facilities.

1. MCC Panel general arrangement diagram.
2. MCC panel electrical wiring diagram.
3. Final switchgear and instrument BOM
4. Manuals, catalogues, test reports of all bought out items.
5. MCC panel internal test report

12. ***15. APPROVED MANUFACTURERS OF EQUIPMENT***

- MCC Components : L&T/Siemens
- Lamps(Filament/LED) : ESBEE/Siemens/Teknik
- Contactors : L&T/Siemens
- Overload Relays : L&T/Siemens
- MCB/MCCB/MPCB/SFU : L&T/Siemens
- Ammeter/Voltmeter s/s : Salzer/Kaycee
- Relays (Plug-in type) : Omron
- Terminals (Clip-on type) : Elmex/FTC/phoenix
- Timers : L&T/Siemens
- Tube light / CFL : L&T/SIEMENS
- Power & Control Cables : Gloster/KEI
- Instrument Cable Screened : Rashi/RR Kables/Lapp/KEI
- Cable ducts : Salzer/SFX /Trinity
- Lugs : Dowell's / Braco/Trinity
- Ammeter/Voltmeter/kwh : Rishab/AE(Digital type)

- Door limit switch : BCH/Jai Balaji
- Current transformer : AE/Starlit/Precise/Newtek/Rishab
- Variable Frequency Drive : ABB
- Push Buttons : ESBEE/Siemens/Teknik
- Signal Isolator 4-20ma : Massibus
- Panel Name : UEL
- Control Transformer : Ste-Up/Pratik
- Capacitor : L&T/Siemens
- Choke : Ste-Up/Pratik
- Timer : L&T Siemens
- Semiconductor : Bussman
- Temperature Sccaner : Radix/Massibus

Other items shall be as per panel manufacturer's standard providing that replacements are easily available.

13. ***16. SITE COMMISSIONING AND SITE TESTING***

Vendor shall provide 15 days site service for the start-up and commissioning activities

17. LOCAL CONTROL PUSH BUTTON STATIONS FOR VFD MOTORS :

Aluminum Die cast / MS Enclosure shall be suitable for outdoor installation with canopy minimum IP 55 protection. LPBS shall have the remote push button shall have Digital type ammeter, RPM meter, start & stop, stop push button stay put type mushroom head press to lock and turn to release type key less mechanism off push button, speed increase, Decrease Push Button. on ,off ,trip indication cluster type LED lamps etc. Quantity of VFD LPBS station 10 nos.

Digital RPM indicator details for VFD Local control Push button stations :

Sr. No	DESCRIPTION	CALBRATION RPM RANGE	QUANTITY	MOTOR KW/POLE
1	Boiler Feed Water Pump-1&2	0-3000	2 PCS	160/2
2	ID Fan	0-750	1 PCS	200/8
3	FD Fan	0-1500	1 PCS	75/4
4	Bagasse Drum Extractors Feeders	0-1500	3 PCS	7.5/4
5	Screw Feeders for Rice Husk	0-1500	3 PCS	2.2/4

8. LOCAL CONTROL PUSH BUTTON STATIONS FOR NON VFD MOTORS :

Aluminum Die cast / MS Enclosure shall be suitable for outdoor installation with canopy minimum IP 55 protection. LPBS shall have start & Stop Push button, the stop push button shall be press to lock and turn to release type key less mechanism. Under locked position the drive operation is inhibited from remote (MCC).
Quantity of Non-VFD LPBS station 30 nos.

Note : For above items multiple choices are given however for a particular item vendor shall use only one make throughout the panel. For any other make of above items vendor shall ask for written approved deviation from purchaser.

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