



# TECHNICAL SPECIFICATION FOR LT SWITCHGEAR PACKAGE

**PROJECT**                      **40MW CDQ WASTE HEAT RECOVERY  
CO-GENERATION POWER PLANT**

**CUSTOMER**                **M/S TATA STEEL LIMITED,  
JAMSHEDPUR**

**CONSULTANT**            **TATA CONSULTING ENGINEERS,  
KOLKATA**

**Revisions**

Refer to record of revisions

**Prepared**  
APURVA SINGH**Checked**  
K. RANGAMANI**Approved**  
B. C. MOHANTY**Date**

16-08-2016

| TD-201<br>Rev No. 00<br>Form No.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  | <b>PRODUCT STANDARD</b><br>PROJECT ENGINEERING & SYSTEMS DIVISION, HYDERABAD | <b>PY55223</b> |         |             |     |                         |     |                 |     |               |     |                     |     |                   |     |                      |     |                        |     |                                    |     |               |      |           |      |              |      |                      |      |                    |      |                               |         |          |             |   |             |                                            |   |             |                                             |   |             |                              |   |             |                      |   |             |                          |  |             |                               |   |            |                  |   |            |                  |   |                       |           |   |            |                 |    |            |             |    |            |                  |    |            |                              |    |             |              |    |             |                                        |    |             |                                    |    |             |                                                   |    |             |                        |    |             |                               |
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| <div><div>COPYRIGHT AND CONFIDENTIAL<br/>The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED.<br/>It must not be used directly or indirectly in any way detrimental to the interest of the company.</div><div><div>Ref. Doc</div><div><div><div>TABLE OF CONTENTS</div><table><tr><th>Sl. No.</th><th>Description</th></tr><tr><td>1.0</td><td>Intent of Specification</td></tr><tr><td>2.0</td><td>Site Conditions</td></tr><tr><td>3.0</td><td>Scope of Work</td></tr><tr><td>4.0</td><td>Codes and Standards</td></tr><tr><td>5.0</td><td>Order of Priority</td></tr><tr><td>6.0</td><td>General Requirements</td></tr><tr><td>7.0</td><td>Technical Requirements</td></tr><tr><td>8.0</td><td>Inspection, Testing and Acceptance</td></tr><tr><td>9.0</td><td>Documentation</td></tr><tr><td>10.0</td><td>Guarantee</td></tr><tr><td>11.0</td><td>Quality Plan</td></tr><tr><td>12.0</td><td>Packing and Dispatch</td></tr><tr><td>13.0</td><td>Special Conditions</td></tr><tr><td>14.0</td><td>Check List for Bid Submission</td></tr></table></div><div><div>LIST OF ANNEXURES</div><table><tr><th>Sl. No.</th><th>Annexure</th><th>Description</th></tr><tr><td>1</td><td>Annexure-1A</td><td>Standard Specification for LT Switchboards</td></tr><tr><td>2</td><td>Annexure-1B</td><td>Standard Specification for Numerical Relays</td></tr><tr><td>3</td><td>Annexure-1C</td><td>Data Sheet for LT Switchgear</td></tr><tr><td>4</td><td>Annexure-2A</td><td>Reference Schematics</td></tr><tr><td>5</td><td>Annexure-2B</td><td>Drive Control Philosophy</td></tr><tr><td></td><td>Annexure-2C</td><td>Electrical Control Philosophy</td></tr><tr><td>6</td><td>Annexure-3</td><td>Switchboard SLDs</td></tr><tr><td>7</td><td>Annexure-4</td><td>I/O Signals List</td></tr><tr><td>8</td><td><del>Annexure-5</del></td><td>[Deleted]</td></tr><tr><td>9</td><td>Annexure-6</td><td>Sub-vendor List</td></tr><tr><td>10</td><td>Annexure-7</td><td>Feeder List</td></tr><tr><td>11</td><td>Annexure-8</td><td>Deviation Format</td></tr><tr><td>12</td><td>Annexure-9</td><td>Inspection Test Requirements</td></tr><tr><td>13</td><td>Annexure-10</td><td>Price Format</td></tr><tr><td>14</td><td>Annexure-11</td><td>Package Execution Milestones/ Schedule</td></tr><tr><td>15</td><td>Annexure-12</td><td>List of Spares and Tools &amp; Tackles</td></tr><tr><td>16</td><td>Annexure-13</td><td>Documents to be submitted after award of contract</td></tr><tr><td>17</td><td>Annexure-14</td><td>Painting Specification</td></tr><tr><td>18</td><td>Annexure-15</td><td>Check List for Bid Submission</td></tr></table></div></div></div></div> |                                                                                   |                                                                              |                | Sl. No. | Description | 1.0 | Intent of Specification | 2.0 | Site Conditions | 3.0 | Scope of Work | 4.0 | Codes and Standards | 5.0 | Order of Priority | 6.0 | General Requirements | 7.0 | Technical Requirements | 8.0 | Inspection, Testing and Acceptance | 9.0 | Documentation | 10.0 | Guarantee | 11.0 | Quality Plan | 12.0 | Packing and Dispatch | 13.0 | Special Conditions | 14.0 | Check List for Bid Submission | Sl. No. | Annexure | Description | 1 | Annexure-1A | Standard Specification for LT Switchboards | 2 | Annexure-1B | Standard Specification for Numerical Relays | 3 | Annexure-1C | Data Sheet for LT Switchgear | 4 | Annexure-2A | Reference Schematics | 5 | Annexure-2B | Drive Control Philosophy |  | Annexure-2C | Electrical Control Philosophy | 6 | Annexure-3 | Switchboard SLDs | 7 | Annexure-4 | I/O Signals List | 8 | <del>Annexure-5</del> | [Deleted] | 9 | Annexure-6 | Sub-vendor List | 10 | Annexure-7 | Feeder List | 11 | Annexure-8 | Deviation Format | 12 | Annexure-9 | Inspection Test Requirements | 13 | Annexure-10 | Price Format | 14 | Annexure-11 | Package Execution Milestones/ Schedule | 15 | Annexure-12 | List of Spares and Tools & Tackles | 16 | Annexure-13 | Documents to be submitted after award of contract | 17 | Annexure-14 | Painting Specification | 18 | Annexure-15 | Check List for Bid Submission |
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| 16                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Annexure-13                                                                       | Documents to be submitted after award of contract                            |                |         |             |     |                         |     |                 |     |               |     |                     |     |                   |     |                      |     |                        |     |                                    |     |               |      |           |      |              |      |                      |      |                    |      |                               |         |          |             |   |             |                                            |   |             |                                             |   |             |                              |   |             |                      |   |             |                          |  |             |                               |   |            |                  |   |            |                  |   |                       |           |   |            |                 |    |            |             |    |            |                  |    |            |                              |    |             |              |    |             |                                        |    |             |                                    |    |             |                                                   |    |             |                        |    |             |                               |
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| TD-201<br>Rev No. 00<br>Form No.                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>PRODUCT STANDARD</b><br>PROJECT ENGINEERING & SYSTEMS DIVISION, HYDERABAD | <b>PY55223</b>                                                          |         |             |      |   |         |                                                                         |   |               |                       |   |                     |                           |   |                             |        |   |                             |       |   |                            |      |   |                  |                                    |   |                   |                                       |   |              |                               |
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| <div>COPYRIGHT AND CONFIDENTIAL</div> <div>The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED. It must not be used directly or indirectly in any way detrimental to the interest of the company.</div> | <b>1.0 INTENT OF SPECIFICATION</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                              |                                                                         |         |             |      |   |         |                                                                         |   |               |                       |   |                     |                           |   |                             |        |   |                             |       |   |                            |      |   |                  |                                    |   |                   |                                       |   |              |                               |
|                                                                                                                                                                                                                                          | <p>This specification covers the design, manufacture, assembly and testing at manufacturer's works; packing and transportation to site; supervision of erection, testing and commissioning of LT Switchgear complete with all accessories for efficient and trouble-free operation.</p> <p>It is not the intent to specify completely herein all details of the equipment; nevertheless, the equipment shall be complete and operative in all respects and shall confirm to the highest standard of engineering, design and workmanship.</p>                                                                                                                                                                                                                                                                                       |                                                                              |                                                                         |         |             |      |   |         |                                                                         |   |               |                       |   |                     |                           |   |                             |        |   |                             |       |   |                            |      |   |                  |                                    |   |                   |                                       |   |              |                               |
|                                                                                                                                                                                                                                          | <b>2.0 SITE CONDITIONS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                              |                                                                         |         |             |      |   |         |                                                                         |   |               |                       |   |                     |                           |   |                             |        |   |                             |       |   |                            |      |   |                  |                                    |   |                   |                                       |   |              |                               |
|                                                                                                                                                                                                                                          | <table><tr><th>Sl. No.</th><th>Description</th><th>Data</th></tr><tr><td>1</td><td>Project</td><td>40MW CDQ Waste Heat Recovery Co-Generation Power Plant, Tata Steel Ltd.</td></tr><tr><td>2</td><td>Site Location</td><td>Jamshedpur, Jharkhand</td></tr><tr><td>3</td><td>Elevation Above MSL</td><td>129m above Mean Sea Level</td></tr><tr><td>4</td><td>Maximum Ambient Temperature</td><td>47.2°C</td></tr><tr><td>5</td><td>Minimum Ambient Temperature</td><td>3.9°C</td></tr><tr><td>6</td><td>Design Ambient Temperature</td><td>50°C</td></tr><tr><td>7</td><td>Site Environment</td><td>Tropical, Industrial and Corrosive</td></tr><tr><td>8</td><td>Relative Humidity</td><td>Maximum 84%, Minimum 24%, Average 53%</td></tr><tr><td>9</td><td>Seismic Zone</td><td>Zone-II as per IS-1893 Part-1</td></tr></table> |                                                                              |                                                                         | Sl. No. | Description | Data | 1 | Project | 40MW CDQ Waste Heat Recovery Co-Generation Power Plant, Tata Steel Ltd. | 2 | Site Location | Jamshedpur, Jharkhand | 3 | Elevation Above MSL | 129m above Mean Sea Level | 4 | Maximum Ambient Temperature | 47.2°C | 5 | Minimum Ambient Temperature | 3.9°C | 6 | Design Ambient Temperature | 50°C | 7 | Site Environment | Tropical, Industrial and Corrosive | 8 | Relative Humidity | Maximum 84%, Minimum 24%, Average 53% | 9 | Seismic Zone | Zone-II as per IS-1893 Part-1 |
|                                                                                                                                                                                                                                          | Sl. No.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Description                                                                  | Data                                                                    |         |             |      |   |         |                                                                         |   |               |                       |   |                     |                           |   |                             |        |   |                             |       |   |                            |      |   |                  |                                    |   |                   |                                       |   |              |                               |
|                                                                                                                                                                                                                                          | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Project                                                                      | 40MW CDQ Waste Heat Recovery Co-Generation Power Plant, Tata Steel Ltd. |         |             |      |   |         |                                                                         |   |               |                       |   |                     |                           |   |                             |        |   |                             |       |   |                            |      |   |                  |                                    |   |                   |                                       |   |              |                               |
|                                                                                                                                                                                                                                          | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Site Location                                                                | Jamshedpur, Jharkhand                                                   |         |             |      |   |         |                                                                         |   |               |                       |   |                     |                           |   |                             |        |   |                             |       |   |                            |      |   |                  |                                    |   |                   |                                       |   |              |                               |
|                                                                                                                                                                                                                                          | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Elevation Above MSL                                                          | 129m above Mean Sea Level                                               |         |             |      |   |         |                                                                         |   |               |                       |   |                     |                           |   |                             |        |   |                             |       |   |                            |      |   |                  |                                    |   |                   |                                       |   |              |                               |
|                                                                                                                                                                                                                                          | 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Maximum Ambient Temperature                                                  | 47.2°C                                                                  |         |             |      |   |         |                                                                         |   |               |                       |   |                     |                           |   |                             |        |   |                             |       |   |                            |      |   |                  |                                    |   |                   |                                       |   |              |                               |
|                                                                                                                                                                                                                                          | 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Minimum Ambient Temperature                                                  | 3.9°C                                                                   |         |             |      |   |         |                                                                         |   |               |                       |   |                     |                           |   |                             |        |   |                             |       |   |                            |      |   |                  |                                    |   |                   |                                       |   |              |                               |
| 6                                                                                                                                                                                                                                        | Design Ambient Temperature                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 50°C                                                                         |                                                                         |         |             |      |   |         |                                                                         |   |               |                       |   |                     |                           |   |                             |        |   |                             |       |   |                            |      |   |                  |                                    |   |                   |                                       |   |              |                               |
| 7                                                                                                                                                                                                                                        | Site Environment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Tropical, Industrial and Corrosive                                           |                                                                         |         |             |      |   |         |                                                                         |   |               |                       |   |                     |                           |   |                             |        |   |                             |       |   |                            |      |   |                  |                                    |   |                   |                                       |   |              |                               |
| 8                                                                                                                                                                                                                                        | Relative Humidity                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Maximum 84%, Minimum 24%, Average 53%                                        |                                                                         |         |             |      |   |         |                                                                         |   |               |                       |   |                     |                           |   |                             |        |   |                             |       |   |                            |      |   |                  |                                    |   |                   |                                       |   |              |                               |
| 9                                                                                                                                                                                                                                        | Seismic Zone                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Zone-II as per IS-1893 Part-1                                                |                                                                         |         |             |      |   |         |                                                                         |   |               |                       |   |                     |                           |   |                             |        |   |                             |       |   |                            |      |   |                  |                                    |   |                   |                                       |   |              |                               |
| <b>3.0 SCOPE OF WORK</b>                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                              |                                                                         |         |             |      |   |         |                                                                         |   |               |                       |   |                     |                           |   |                             |        |   |                             |       |   |                            |      |   |                  |                                    |   |                   |                                       |   |              |                               |
| <b>3.1 Switchboards</b>                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                              |                                                                         |         |             |      |   |         |                                                                         |   |               |                       |   |                     |                           |   |                             |        |   |                             |       |   |                            |      |   |                  |                                    |   |                   |                                       |   |              |                               |
| 3.1.1 Supply of Switchboards and Wall Mounted DBs as per Enquiry and Specification.                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                              |                                                                         |         |             |      |   |         |                                                                         |   |               |                       |   |                     |                           |   |                             |        |   |                             |       |   |                            |      |   |                  |                                    |   |                   |                                       |   |              |                               |
| 3.1.2 Supply of cable termination accessories such as Lugs, Glands etc. for Switchgear end for all Power and Control cables.                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                              |                                                                         |         |             |      |   |         |                                                                         |   |               |                       |   |                     |                           |   |                             |        |   |                             |       |   |                            |      |   |                  |                                    |   |                   |                                       |   |              |                               |
| 3.1.3 Supply of Laptop with software and accessories (such as cable) for NR commissioning.                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                              |                                                                         |         |             |      |   |         |                                                                         |   |               |                       |   |                     |                           |   |                             |        |   |                             |       |   |                            |      |   |                  |                                    |   |                   |                                       |   |              |                               |
| <b>3.2 Local Starters</b>                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                              |                                                                         |         |             |      |   |         |                                                                         |   |               |                       |   |                     |                           |   |                             |        |   |                             |       |   |                            |      |   |                  |                                    |   |                   |                                       |   |              |                               |
| Not applicable.                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                              |                                                                         |         |             |      |   |         |                                                                         |   |               |                       |   |                     |                           |   |                             |        |   |                             |       |   |                            |      |   |                  |                                    |   |                   |                                       |   |              |                               |
| <b>3.3 Load Break Switches</b>                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                              |                                                                         |         |             |      |   |         |                                                                         |   |               |                       |   |                     |                           |   |                             |        |   |                             |       |   |                            |      |   |                  |                                    |   |                   |                                       |   |              |                               |
| Not applicable.                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                              |                                                                         |         |             |      |   |         |                                                                         |   |               |                       |   |                     |                           |   |                             |        |   |                             |       |   |                            |      |   |                  |                                    |   |                   |                                       |   |              |                               |
| <b>3.4 Data Concentrator Package</b>                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                              |                                                                         |         |             |      |   |         |                                                                         |   |               |                       |   |                     |                           |   |                             |        |   |                             |       |   |                            |      |   |                  |                                    |   |                   |                                       |   |              |                               |
| Not applicable.                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                              |                                                                         |         |             |      |   |         |                                                                         |   |               |                       |   |                     |                           |   |                             |        |   |                             |       |   |                            |      |   |                  |                                    |   |                   |                                       |   |              |                               |
| Ref. Doc                                                                                                                                                                                                                                 | <b>3.5 Services</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                              |                                                                         |         |             |      |   |         |                                                                         |   |               |                       |   |                     |                           |   |                             |        |   |                             |       |   |                            |      |   |                  |                                    |   |                   |                                       |   |              |                               |
|                                                                                                                                                                                                                                          | 3.5.1 Deleted.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                              |                                                                         |         |             |      |   |         |                                                                         |   |               |                       |   |                     |                           |   |                             |        |   |                             |       |   |                            |      |   |                  |                                    |   |                   |                                       |   |              |                               |
|                                                                                                                                                                                                                                          | 3.5.2 <b>(Optional)</b> Services to check completeness of LT Switchgear package at site by OEM, if required (Refer Price Format).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                              |                                                                         |         |             |      |   |         |                                                                         |   |               |                       |   |                     |                           |   |                             |        |   |                             |       |   |                            |      |   |                  |                                    |   |                   |                                       |   |              |                               |
|                                                                                                                                                                                                                                          | 3.5.3 Modification/ Additional job on LT Switchgear package at site by OEM, if required.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                              |                                                                         |         |             |      |   |         |                                                                         |   |               |                       |   |                     |                           |   |                             |        |   |                             |       |   |                            |      |   |                  |                                    |   |                   |                                       |   |              |                               |

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PRODUCT STANDARD

PROJECT ENGINEERING & SYSTEMS DIVISION, HYDERABAD

PY55223

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3.6Commissioning Spares:

Shall be supplied as part of the main offer and shall be offered for inspection along with 415V PMCC. For list, refer Annexure-12.

3.7Tools and Tackles:

Shall be supplied as part of the main offer and shall be offered for inspection along with 415V PMCC. For list, refer Annexure-12.

3.8Mandatory Spares:

Shall be supplied as part of the main offer and shall be offered for inspection along with 415V PMCC. For list, refer Annexure-12.

4.0CODES AND STANDARDS:

4.1The equipment to be furnished under this specification shall be in accordance with the applicable section of the latest version of the following BIS/IEC/ISO standards unless otherwise specified:

| Standard                                             | Description                                                                                                    |
|------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| IS 60947; BSEN 60947; IEC 60439-1                    | Switchgear general requirements                                                                                |
| IS 13118; BSEN 60947-2; IEC 947-2, BS 3871 (PI) MCCB | AC circuit breaker                                                                                             |
| IS 8623; BS 5486; IEC 439                            | Factory built assemblies of switchgear & control gear for voltages up to & including 1000 V AC & 1200 V DC     |
| IS 60947; BSEN 60947-3; IEC 947-3                    | Air Break Switches                                                                                             |
| IS 8828                                              | Miniature circuit breaker                                                                                      |
| IS 13703; BS 88; IEC 769                             | HRC cartridge fuses                                                                                            |
| IS 8187                                              | D type fuses                                                                                                   |
| IS 60947; BSEN 60947-1; IEC 947-4-1                  | Contactors                                                                                                     |
| IS 60947; BSEN 60947-2; IEC 947-4-2                  | Starters                                                                                                       |
| IS 60947                                             | Control switches/push buttons                                                                                  |
| IS 2705; BS 7626; IEC 60044                          | Current transformers                                                                                           |
| IS 3156; BS 7625; IEC 60044                          | Voltage transformers                                                                                           |
| IS 3231; BS 142; IEC 255                             | Relays                                                                                                         |
| IS 1248; BS 89; IEC 51                               | Indicating instruments                                                                                         |
| IS 5578 & 11353; BS 159                              | Arrangement for bus bars main connections & accessories                                                        |
| IS 8530; BS 37                                       | AC electricity meters                                                                                          |
| IS 13947; IEC 947-1                                  | Degree of protection                                                                                           |
| IS 62262                                             | The performance of AC control gear equipment rated up to 600V for use on high prospective fault current system |
| IS 10118                                             | Code of practice for installation & maintenance of switchgear                                                  |
| IS 3202                                              | Climate proofing of electrical equipment                                                                       |
| IS 6005; BS 3169                                     | Code of practice for Phosphating iron & steel                                                                  |
| IS 5082; BS 2898; IEC 114                            | Wrought aluminium & aluminium alloys for electrical purposes                                                   |
| IS 12021                                             | Control transformer for switchgear & control gear for voltage not exceeding 110 V AC                           |

Ref. Doc

|                                                                                                                                                                                                                       |                                                                                   |                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                       |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TD-201<br>Rev No. 00<br>Form No.                                                                                                                                                                                      |  | <b>PRODUCT STANDARD</b><br>PROJECT ENGINEERING & SYSTEMS DIVISION, HYDERABAD                                                                                                           | <b>PY55223</b>                                                                                                                                                                                                                                                                                                                                                        |
|                                                                                                                                                                                                                       |                                                                                   |                                                                                                                                                                                        | Rev No. 00                                                                                                                                                                                                                                                                                                                                                            |
|                                                                                                                                                                                                                       |                                                                                   |                                                                                                                                                                                        | Page 5 of 14                                                                                                                                                                                                                                                                                                                                                          |
| COPYRIGHT AND CONFIDENTIAL<br>The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED. It must not be used directly or indirectly in any way detrimental to the interest of the company. | Ref. Doc                                                                          | <b>ANSI/ IEEE C.37.20.7</b>                                                                                                                                                            | Testing Guide                                                                                                                                                                                                                                                                                                                                                         |
|                                                                                                                                                                                                                       |                                                                                   | 4.2                                                                                                                                                                                    | In case of imported equipments, Standards of the country of origin shall be applicable if these standards are equivalent or stringent than the applicable Indian Standards.                                                                                                                                                                                           |
|                                                                                                                                                                                                                       |                                                                                   | 4.3                                                                                                                                                                                    | The equipment shall also confirm to the provisions of Indian Electricity Rules and other statutory regulations currently in force in the country.                                                                                                                                                                                                                     |
|                                                                                                                                                                                                                       |                                                                                   | 4.4                                                                                                                                                                                    | In case Indian Standards are not available for any equipment, Standards issued by the IEC/ BS/ VDE/ IEEE/ NEMA or equivalent agency shall be applicable.                                                                                                                                                                                                              |
|                                                                                                                                                                                                                       |                                                                                   | <b>5.0</b>                                                                                                                                                                             | <b>ORDER OF PRIORITY</b>                                                                                                                                                                                                                                                                                                                                              |
|                                                                                                                                                                                                                       |                                                                                   | 5.1                                                                                                                                                                                    | In case of any contradictions between various referred Standards/ Specifications/ Data Sheets/ Statutory Regulations/ enclosed annexures, the following sequence shall be followed as order of priority:                                                                                                                                                              |
|                                                                                                                                                                                                                       |                                                                                   | 1.                                                                                                                                                                                     | <i>Statutory Regulations</i>                                                                                                                                                                                                                                                                                                                                          |
|                                                                                                                                                                                                                       |                                                                                   | 2.                                                                                                                                                                                     | <i>This specification:</i>                                                                                                                                                                                                                                                                                                                                            |
|                                                                                                                                                                                                                       |                                                                                   | (i)                                                                                                                                                                                    | PY55223                                                                                                                                                                                                                                                                                                                                                               |
|                                                                                                                                                                                                                       |                                                                                   | (ii)                                                                                                                                                                                   | Standard Specification of LT Switchboards (Annexure-1A) / Standard Specification of Numerical relays (Annexure-1B)                                                                                                                                                                                                                                                    |
|                                                                                                                                                                                                                       |                                                                                   | (iii)                                                                                                                                                                                  | Feeder List (Annexure-7) (Refer Notes below)                                                                                                                                                                                                                                                                                                                          |
|                                                                                                                                                                                                                       |                                                                                   | (iv)                                                                                                                                                                                   | Switchboard SLDs (Annexure-3) (Refer Notes below)                                                                                                                                                                                                                                                                                                                     |
|                                                                                                                                                                                                                       |                                                                                   | (v)                                                                                                                                                                                    | Other Annexures                                                                                                                                                                                                                                                                                                                                                       |
|                                                                                                                                                                                                                       |                                                                                   | 3.                                                                                                                                                                                     | <i>Codes and Standards</i>                                                                                                                                                                                                                                                                                                                                            |
|                                                                                                                                                                                                                       |                                                                                   | <b>Note - A:</b> Feeder List holds higher priority than the Switchboard SLDs for feeder description, type, rating, quantity, bus-wise distribution and their respective cable details. |                                                                                                                                                                                                                                                                                                                                                                       |
|                                                                                                                                                                                                                       |                                                                                   | <b>Note - B:</b> For metering, protection and fitments, details as provided in Switchboard SLDs and PY55223 have to be followed.                                                       |                                                                                                                                                                                                                                                                                                                                                                       |
|                                                                                                                                                                                                                       |                                                                                   | 5.2                                                                                                                                                                                    | In case of further contradiction among above documents, it is bidder's responsibility to highlight the same during bid stage itself. Else, BHEL's decision shall be final during execution. The same shall be complied without any time / cost implication to BHEL.                                                                                                   |
|                                                                                                                                                                                                                       |                                                                                   | <b>6.0</b>                                                                                                                                                                             | <b>GENERAL REQUIREMENTS</b>                                                                                                                                                                                                                                                                                                                                           |
|                                                                                                                                                                                                                       |                                                                                   | 6.1                                                                                                                                                                                    | The offered equipment shall be brand new with state of art technology and proven field track record. No prototype equipment shall be offered.                                                                                                                                                                                                                         |
|                                                                                                                                                                                                                       |                                                                                   | 6.2                                                                                                                                                                                    | Vendor shall ensure availability of spare parts and maintenance support services for the offered equipment at least for 15 years from the date of supply.                                                                                                                                                                                                             |
|                                                                                                                                                                                                                       |                                                                                   | 6.3                                                                                                                                                                                    | Vendor shall give a notice of at least one year to the end user of equipment and BHEL before phasing out the product/ spares to enable the end user for placement of order for spares and services.                                                                                                                                                                   |
|                                                                                                                                                                                                                       |                                                                                   | 6.4                                                                                                                                                                                    | In case of relays manufactured outside India, the Relay manufacturer through their Indian establishment or associate in India shall provide application, testing, commissioning, after sales service and other necessary support for minimum of 15 years to customer. Their Indian establishment or associate company in India shall also maintain adequate inventory |

| TD-201<br>Rev No. 00<br>Form No.                                                                                                                                                                                                         |                                                                                                                                                                                                                 | <div>PRODUCT STANDARD</div> <div>PROJECT ENGINEERING &amp; SYSTEMS DIVISION, HYDERABAD</div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | PY55223                                                                |          |                                 |       |                                     |         |                                                                        |       |                          |                        |   |           |               |   |                         |                                  |   |                 |                 |   |                  |                                                  |   |                |                                                                                                       |   |                                        |           |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|----------|---------------------------------|-------|-------------------------------------|---------|------------------------------------------------------------------------|-------|--------------------------|------------------------|---|-----------|---------------|---|-------------------------|----------------------------------|---|-----------------|-----------------|---|------------------|--------------------------------------------------|---|----------------|-------------------------------------------------------------------------------------------------------|---|----------------------------------------|-----------|
|                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Rev No. 00                                                             |          |                                 |       |                                     |         |                                                                        |       |                          |                        |   |           |               |   |                         |                                  |   |                 |                 |   |                  |                                                  |   |                |                                                                                                       |   |                                        |           |
|                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Page 6 of 14                                                           |          |                                 |       |                                     |         |                                                                        |       |                          |                        |   |           |               |   |                         |                                  |   |                 |                 |   |                  |                                                  |   |                |                                                                                                       |   |                                        |           |
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|                                                                                                                                                                                                                                          | 6.5                                                                                                                                                                                                                                                                                              | Only major relays, meters and controls are indicated in the Switchboard SLDs. Any auxiliary relays, timers, switches, contactors, contacts, indications etc. as required while developing the control schematics or felt necessary for safe operation, even if these are not specifically mentioned, shall be supplied without any time and price implications.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                        |          |                                 |       |                                     |         |                                                                        |       |                          |                        |   |           |               |   |                         |                                  |   |                 |                 |   |                  |                                                  |   |                |                                                                                                       |   |                                        |           |
|                                                                                                                                                                                                                                          | 6.6                                                                                                                                                                                                                                                                                              | All dummy panels and rear extensions required for bus trunking, cable terminations, mounting of relays, metering and control components etc. shall be supplied. The details of dummy panels shall be finalized during detailed engineering/ project execution and unit rates will be used in case the need arises. Hence, their price shall not be included in the main prices of switchboards.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                        |          |                                 |       |                                     |         |                                                                        |       |                          |                        |   |           |               |   |                         |                                  |   |                 |                 |   |                  |                                                  |   |                |                                                                                                       |   |                                        |           |
|                                                                                                                                                                                                                                          | 7.0                                                                                                                                                                                                                                                                                              | TECHNICAL REQUIREMENTS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                        |          |                                 |       |                                     |         |                                                                        |       |                          |                        |   |           |               |   |                         |                                  |   |                 |                 |   |                  |                                                  |   |                |                                                                                                       |   |                                        |           |
|                                                                                                                                                                                                                                          | 7.1                                                                                                                                                                                                                                                                                              | Operating Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                        |          |                                 |       |                                     |         |                                                                        |       |                          |                        |   |           |               |   |                         |                                  |   |                 |                 |   |                  |                                                  |   |                |                                                                                                       |   |                                        |           |
|                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                  | <table><tr><th>Sl. No.</th><th>Description</th><th>Data</th></tr><tr><td>1</td><td>Voltage</td><td>As specified in Switchboard SLDs (with voltage variation +10% to -15%)</td></tr><tr><td>2</td><td>Number of Phases &amp; Wires</td><td>3-phase, <b>3-wire</b></td></tr><tr><td>3</td><td>Frequency</td><td>50Hz <math>\pm</math> 6%</td></tr><tr><td>4</td><td>Switchboard Fault Level</td><td>As specified in Switchboard SLDs</td></tr><tr><td>5</td><td>System Earthing</td><td>Solidly Earthed</td></tr><tr><td>6</td><td>Auxiliary Supply</td><td>110V <math>\pm</math> 10%, 1-ph, 50Hz AC; 220V <math>\pm</math> 10% DC</td></tr><tr><td>7</td><td>Control Supply</td><td>220V DC for Breaker coils, Breaker Spring Charging Motor, DC Contactors and 110V AC for AC Contactors</td></tr><tr><td>8</td><td>Power supply for spring charging motor</td><td>Universal</td></tr></table> |                                                                        | Sl. No.  | Description                     | Data  | 1                                   | Voltage | As specified in Switchboard SLDs (with voltage variation +10% to -15%) | 2     | Number of Phases & Wires | 3-phase, <b>3-wire</b> | 3 | Frequency | 50Hz $\pm$ 6% | 4 | Switchboard Fault Level | As specified in Switchboard SLDs | 5 | System Earthing | Solidly Earthed | 6 | Auxiliary Supply | 110V $\pm$ 10%, 1-ph, 50Hz AC; 220V $\pm$ 10% DC | 7 | Control Supply | 220V DC for Breaker coils, Breaker Spring Charging Motor, DC Contactors and 110V AC for AC Contactors | 8 | Power supply for spring charging motor | Universal |
|                                                                                                                                                                                                                                          | Sl. No.                                                                                                                                                                                                                                                                                          | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Data                                                                   |          |                                 |       |                                     |         |                                                                        |       |                          |                        |   |           |               |   |                         |                                  |   |                 |                 |   |                  |                                                  |   |                |                                                                                                       |   |                                        |           |
|                                                                                                                                                                                                                                          | 1                                                                                                                                                                                                                                                                                                | Voltage                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | As specified in Switchboard SLDs (with voltage variation +10% to -15%) |          |                                 |       |                                     |         |                                                                        |       |                          |                        |   |           |               |   |                         |                                  |   |                 |                 |   |                  |                                                  |   |                |                                                                                                       |   |                                        |           |
|                                                                                                                                                                                                                                          | 2                                                                                                                                                                                                                                                                                                | Number of Phases & Wires                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 3-phase, <b>3-wire</b>                                                 |          |                                 |       |                                     |         |                                                                        |       |                          |                        |   |           |               |   |                         |                                  |   |                 |                 |   |                  |                                                  |   |                |                                                                                                       |   |                                        |           |
|                                                                                                                                                                                                                                          | 3                                                                                                                                                                                                                                                                                                | Frequency                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 50Hz $\pm$ 6%                                                          |          |                                 |       |                                     |         |                                                                        |       |                          |                        |   |           |               |   |                         |                                  |   |                 |                 |   |                  |                                                  |   |                |                                                                                                       |   |                                        |           |
| 4                                                                                                                                                                                                                                        | Switchboard Fault Level                                                                                                                                                                                                                                                                          | As specified in Switchboard SLDs                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                        |          |                                 |       |                                     |         |                                                                        |       |                          |                        |   |           |               |   |                         |                                  |   |                 |                 |   |                  |                                                  |   |                |                                                                                                       |   |                                        |           |
| 5                                                                                                                                                                                                                                        | System Earthing                                                                                                                                                                                                                                                                                  | Solidly Earthed                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                        |          |                                 |       |                                     |         |                                                                        |       |                          |                        |   |           |               |   |                         |                                  |   |                 |                 |   |                  |                                                  |   |                |                                                                                                       |   |                                        |           |
| 6                                                                                                                                                                                                                                        | Auxiliary Supply                                                                                                                                                                                                                                                                                 | 110V $\pm$ 10%, 1-ph, 50Hz AC; 220V $\pm$ 10% DC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                        |          |                                 |       |                                     |         |                                                                        |       |                          |                        |   |           |               |   |                         |                                  |   |                 |                 |   |                  |                                                  |   |                |                                                                                                       |   |                                        |           |
| 7                                                                                                                                                                                                                                        | Control Supply                                                                                                                                                                                                                                                                                   | 220V DC for Breaker coils, Breaker Spring Charging Motor, DC Contactors and 110V AC for AC Contactors                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                        |          |                                 |       |                                     |         |                                                                        |       |                          |                        |   |           |               |   |                         |                                  |   |                 |                 |   |                  |                                                  |   |                |                                                                                                       |   |                                        |           |
| 8                                                                                                                                                                                                                                        | Power supply for spring charging motor                                                                                                                                                                                                                                                           | Universal                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                        |          |                                 |       |                                     |         |                                                                        |       |                          |                        |   |           |               |   |                         |                                  |   |                 |                 |   |                  |                                                  |   |                |                                                                                                       |   |                                        |           |
| 7.2                                                                                                                                                                                                                                      | LT Switchboards                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                        |          |                                 |       |                                     |         |                                                                        |       |                          |                        |   |           |               |   |                         |                                  |   |                 |                 |   |                  |                                                  |   |                |                                                                                                       |   |                                        |           |
| 7.2.1                                                                                                                                                                                                                                    | The switchboards shall be suitable for installation and satisfactory operation in <b>an air-conditioned substation</b> in a tropical, industrial and corrosive atmosphere. The service conditions are to be considered as typical of a steel plant. The atmosphere is to be considered as dusty. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                        |          |                                 |       |                                     |         |                                                                        |       |                          |                        |   |           |               |   |                         |                                  |   |                 |                 |   |                  |                                                  |   |                |                                                                                                       |   |                                        |           |
| 7.2.2                                                                                                                                                                                                                                    | Minimum degree of enclosure protection:                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                        |          |                                 |       |                                     |         |                                                                        |       |                          |                        |   |           |               |   |                         |                                  |   |                 |                 |   |                  |                                                  |   |                |                                                                                                       |   |                                        |           |
|                                                                                                                                                                                                                                          | <table><tr><th>Switchboard</th><th>IP Class</th></tr><tr><td>PCC/ PMCC (Rating <math>\geq</math> 1600A)</td><td>IP 42</td></tr><tr><td>PCC/ PMCC/ MCC/ DB (Rating &lt; 1600A)</td><td>IP 52</td></tr><tr><td>WMDB</td><td>IP 55</td></tr></table>                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Switchboard                                                            | IP Class | PCC/ PMCC (Rating $\geq$ 1600A) | IP 42 | PCC/ PMCC/ MCC/ DB (Rating < 1600A) | IP 52   | WMDB                                                                   | IP 55 |                          |                        |   |           |               |   |                         |                                  |   |                 |                 |   |                  |                                                  |   |                |                                                                                                       |   |                                        |           |
| Switchboard                                                                                                                                                                                                                              | IP Class                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                        |          |                                 |       |                                     |         |                                                                        |       |                          |                        |   |           |               |   |                         |                                  |   |                 |                 |   |                  |                                                  |   |                |                                                                                                       |   |                                        |           |
| PCC/ PMCC (Rating $\geq$ 1600A)                                                                                                                                                                                                          | IP 42                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                        |          |                                 |       |                                     |         |                                                                        |       |                          |                        |   |           |               |   |                         |                                  |   |                 |                 |   |                  |                                                  |   |                |                                                                                                       |   |                                        |           |
| PCC/ PMCC/ MCC/ DB (Rating < 1600A)                                                                                                                                                                                                      | IP 52                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                        |          |                                 |       |                                     |         |                                                                        |       |                          |                        |   |           |               |   |                         |                                  |   |                 |                 |   |                  |                                                  |   |                |                                                                                                       |   |                                        |           |
| WMDB                                                                                                                                                                                                                                     | IP 55                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                        |          |                                 |       |                                     |         |                                                                        |       |                          |                        |   |           |               |   |                         |                                  |   |                 |                 |   |                  |                                                  |   |                |                                                                                                       |   |                                        |           |
|                                                                                                                                                                                                                                          | Degree of enclosure protection against external mechanical impacts: As per IEC 62262.                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                        |          |                                 |       |                                     |         |                                                                        |       |                          |                        |   |           |               |   |                         |                                  |   |                 |                 |   |                  |                                                  |   |                |                                                                                                       |   |                                        |           |
| 7.2.3                                                                                                                                                                                                                                    | All switchboards shall be draw-out/fixed type (as per SLD), single front/double front (as per SLD), compartmentalized, with Form-3b construction as per IEC 60439-1.                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                        |          |                                 |       |                                     |         |                                                                        |       |                          |                        |   |           |               |   |                         |                                  |   |                 |                 |   |                  |                                                  |   |                |                                                                                                       |   |                                        |           |
| 7.2.4                                                                                                                                                                                                                                    | All the equipment described in this specification is intended for continuous duty at the specified ratings under the specified ambient conditions.                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                        |          |                                 |       |                                     |         |                                                                        |       |                          |                        |   |           |               |   |                         |                                  |   |                 |                 |   |                  |                                                  |   |                |                                                                                                       |   |                                        |           |

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| TD-201<br>Rev No. 00                                                                                                                                                                                                            | Form No. |   | <b>PRODUCT STANDARD</b><br>PROJECT ENGINEERING & SYSTEMS DIVISION, HYDERABAD                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | PY55223      |
|                                                                                                                                                                                                                                 |          |                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Rev No. 00   |
|                                                                                                                                                                                                                                 |          |                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Page 7 of 14 |
| <b>COPYRIGHT AND CONFIDENTIAL</b><br>The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED.<br>It must not be used directly or indirectly in any way detrimental to the interest of the company. |          |                                                                                                                                                                     | <p>7.2.5 Deleted.</p> <p>7.2.6 AC Switchboards shall be suitable for <b>3-phase, 3-wire system</b>. Three phase buses shall be provided. The vertical dropper/interconnection bus bars shall be suitably sized for short time current rating of the main bus bar or circuit current rating, whichever is higher.</p> <p>7.2.7 Indication Lamps shall be of Clustered LED type.</p> <p>7.2.8 Protection relays shall be numerical type or electromagnetic type as specified on the Switchboard SLDs. Metering shall be part of the numerical relay if indicated on SLD. However, discrete meters as indicated in Switchboard SLDs shall also be provided. All other relays shall be electromagnetic/ static type.</p> <p>7.2.9 Multi-function meter, Energy meter or any other meter <i>with communicable feature</i> (if indicated in SLD) shall be provided with TTB and shall be digital type and suitable for communication over Modbus protocol.<br/> <i>MFM shall measure and display at least the following quantities: current, voltage, active power, energy and power factor.</i></p> <p>7.2.10 Transducers as indicated in SLD shall be provided and all Transducers shall have dual (4-20) mA output.</p> <p>7.2.11 Mounting of equipments on trolley is not acceptable.</p> <p>7.2.12 Need for Inter panel wiring of all switchboards at site shall be minimized and such wiring shall be plug type only for ease of installation at site.</p> <p>7.2.13 All logics (including Auto changeover and Momentary paralleling among incomers-bus couplers) shall be implemented in the numerical relay itself and not externally. In case numerical relays are not present, the logics shall be hardwired.</p> <p>7.2.14 Breaker control switches, Selector switches shall be hardwired type.</p> <p>7.2.15 Discrete Check-Synch Relay shall be provided as indicated in SLD. The Relay shall be <b>SKD Type</b>.</p> <p>7.2.16 Suitable terminals shall be provided in the respective panels for interfacing incoming contacts from remote (DCS, ECP). Current rating of these remote contacts shall be 1A, 220V DC or 240V AC. Suitable interposing relays shall be provided to meet the making and breaking current requirements.</p> <p>7.2.17 The DCS interface signals shall be <b>marshalled individually</b> for each motor feeder for all Switchboards.</p> <p>7.2.18 Signals shall be provided as per attached DCS and ECP typical I/O lists. <i>These lists duly filled up with TB nos. and/or address details, for each Feeder/Bus Coupler/PT shall be furnished by the vendor during detailed engineering.</i></p> <p>7.2.19 All potential free contacts and analogue input signals including unused contacts/ports shall be duly wired to the terminal block in the respective panel.</p> <p>7.2.20 For the ACBs <i>where numerical protection relays are not provided</i>, the breakers shall be provided with inbuilt microprocessor based releases with over load, short circuit and earth fault protections with manual reset facility.</p> <p>7.2.21 Circuit breakers/contactors controlling motor feeders shall have a rating of at least 125% of the maximum continuous rating of the connected motors.</p> |              |
|                                                                                                                                                                                                                                 | Ref. Doc |                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |              |



| TD-201<br>Rev No. 00<br>Form No.                                                                                                                                                                                         |                                      | <b>PRODUCT STANDARD</b><br>PROJECT ENGINEERING & SYSTEMS DIVISION, HYDERABAD                                                                                                                                                                                                                                                                                                                             | PY55223                        |          |             |          |             |                          |                       |                                |        |          |                          |                     |                                |        |          |  |  |  |
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|                                                                                                                                                                                                                          |                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                          | Rev No. 00                     |          |             |          |             |                          |                       |                                |        |          |                          |                     |                                |        |          |  |  |  |
|                                                                                                                                                                                                                          |                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                          | Page 8 of 14                   |          |             |          |             |                          |                       |                                |        |          |                          |                     |                                |        |          |  |  |  |
| COPYRIGHT AND CONFIDENTIAL<br>The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED.<br>It must not be used directly or indirectly in any way detrimental to the interest of the company. | 7.2.22                                                                                                                | All circuit breakers shall be of single break type having one pole per phase. Rated breaking duty of ACB: <b>O-0.3s-CO-3s-CO</b>                                                                                                                                                                                                                                                                         |                                |          |             |          |             |                          |                       |                                |        |          |                          |                     |                                |        |          |  |  |  |
|                                                                                                                                                                                                                          | 7.2.23                                                                                                                | Continuous Electrolytic Al [E-91 grade] as per IS 3082 earth bus bar of size 50 x 10mm at the bottom for the whole switchboard line up with studs at two ends for earth connection.                                                                                                                                                                                                                      |                                |          |             |          |             |                          |                       |                                |        |          |                          |                     |                                |        |          |  |  |  |
|                                                                                                                                                                                                                          | 7.2.24                                                                                                                | 20% spare contacts (both NO and NC) shall be provided in 86 Relay.                                                                                                                                                                                                                                                                                                                                       |                                |          |             |          |             |                          |                       |                                |        |          |                          |                     |                                |        |          |  |  |  |
|                                                                                                                                                                                                                          | 7.2.25                                                                                                                | The following are the details of Wall mounted DBs:                                                                                                                                                                                                                                                                                                                                                       |                                |          |             |          |             |                          |                       |                                |        |          |                          |                     |                                |        |          |  |  |  |
|                                                                                                                                                                                                                          |                                                                                                                       | <table><tr><th>Type</th><th>Incomer</th><th>Outgoings</th><th>Quantity</th><th>Fault Level</th></tr><tr><td>Wall mounted DB Type-3AC</td><td>415V AC, 125A TP MCCB</td><td>415V AC, 32A TP MCBs – 15 nos.</td><td>2 nos.</td><td>50 kA/1s</td></tr><tr><td>Wall mounted DB Type-1AC</td><td>415V AC, 32A DP MCB</td><td>240V AC, 10A DP MCBs – 15 nos.</td><td>2 nos.</td><td>25 kA/1s</td></tr></table> | Type                           | Incomer  | Outgoings   | Quantity | Fault Level | Wall mounted DB Type-3AC | 415V AC, 125A TP MCCB | 415V AC, 32A TP MCBs – 15 nos. | 2 nos. | 50 kA/1s | Wall mounted DB Type-1AC | 415V AC, 32A DP MCB | 240V AC, 10A DP MCBs – 15 nos. | 2 nos. | 25 kA/1s |  |  |  |
|                                                                                                                                                                                                                          | Type                                                                                                                  | Incomer                                                                                                                                                                                                                                                                                                                                                                                                  | Outgoings                      | Quantity | Fault Level |          |             |                          |                       |                                |        |          |                          |                     |                                |        |          |  |  |  |
|                                                                                                                                                                                                                          | Wall mounted DB Type-3AC                                                                                              | 415V AC, 125A TP MCCB                                                                                                                                                                                                                                                                                                                                                                                    | 415V AC, 32A TP MCBs – 15 nos. | 2 nos.   | 50 kA/1s    |          |             |                          |                       |                                |        |          |                          |                     |                                |        |          |  |  |  |
|                                                                                                                                                                                                                          | Wall mounted DB Type-1AC                                                                                              | 415V AC, 32A DP MCB                                                                                                                                                                                                                                                                                                                                                                                      | 240V AC, 10A DP MCBs – 15 nos. | 2 nos.   | 25 kA/1s    |          |             |                          |                       |                                |        |          |                          |                     |                                |        |          |  |  |  |
|                                                                                                                                                                                                                          | 7.2.26                                                                                                                | Painting shall be as per the attached Annexure-14. No deviation in this regard shall be acceptable. Paint shade shall be <u>Glossy white for interior</u> and <u>Light grey semi-glossy shade 631 for exterior</u> .                                                                                                                                                                                     |                                |          |             |          |             |                          |                       |                                |        |          |                          |                     |                                |        |          |  |  |  |
|                                                                                                                                                                                                                          | 7.2.27                                                                                                                | Cable glands for 3-core cables shall be weatherproof double compression nickel plated brass type (ET) with check nuts and PVC shrouds. Cable glands for 1-core cables shall be weatherproof double compression aluminium type (ET) with check nuts and PVC shrouds. Cable lugs shall be of tinned copper heavy duty crimped type.                                                                        |                                |          |             |          |             |                          |                       |                                |        |          |                          |                     |                                |        |          |  |  |  |
|                                                                                                                                                                                                                          | 7.2.28                                                                                                                | MCCB terminals shall be shrouded.                                                                                                                                                                                                                                                                                                                                                                        |                                |          |             |          |             |                          |                       |                                |        |          |                          |                     |                                |        |          |  |  |  |
|                                                                                                                                                                                                                          | 7.2.29                                                                                                                | Voltage transformers will have continuous over voltage factor of 1.2 and short time over voltage factor of 1.5 for 30 seconds.                                                                                                                                                                                                                                                                           |                                |          |             |          |             |                          |                       |                                |        |          |                          |                     |                                |        |          |  |  |  |
|                                                                                                                                                                                                                          | 7.2.30                                                                                                                | For DCDBs, outgoing feeders will be monitored for supply 'ON' and contacts for remote annunciation of supply failure will be wired to terminal blocks.                                                                                                                                                                                                                                                   |                                |          |             |          |             |                          |                       |                                |        |          |                          |                     |                                |        |          |  |  |  |
|                                                                                                                                                                                                                          | 7.2.31                                                                                                                | One minute power frequency voltage:<br>Power circuits: 2500V<br>Control circuits: 1500V<br>Aux. circuits connected to sec. of CTs: 2000V                                                                                                                                                                                                                                                                 |                                |          |             |          |             |                          |                       |                                |        |          |                          |                     |                                |        |          |  |  |  |
|                                                                                                                                                                                                                          | 7.2.32                                                                                                                | Maximum temperature of busbars, droppers and contacts at continuous current rating under site reference ambient temperature: 85 deg. C.                                                                                                                                                                                                                                                                  |                                |          |             |          |             |                          |                       |                                |        |          |                          |                     |                                |        |          |  |  |  |
|                                                                                                                                                                                                                          | 7.2.33                                                                                                                | Positive indications will be provided for breaker closing and opening status.                                                                                                                                                                                                                                                                                                                            |                                |          |             |          |             |                          |                       |                                |        |          |                          |                     |                                |        |          |  |  |  |
|                                                                                                                                                                                                                          | 7.2.34                                                                                                                | Locking facility shall be provided for breaker in rack-out position to prevent accidental operation during maintenance work in the respective feeder.                                                                                                                                                                                                                                                    |                                |          |             |          |             |                          |                       |                                |        |          |                          |                     |                                |        |          |  |  |  |
|                                                                                                                                                                                                                          | 7.2.35                                                                                                                | RING TYPE Lugs shall be used in Numerical Relay wiring.                                                                                                                                                                                                                                                                                                                                                  |                                |          |             |          |             |                          |                       |                                |        |          |                          |                     |                                |        |          |  |  |  |
|                                                                                                                                                                                                                          | 7.2.36                                                                                                                | OLR for Soot Blowers and Fans shall be HEAVY DUTY TYPE.                                                                                                                                                                                                                                                                                                                                                  |                                |          |             |          |             |                          |                       |                                |        |          |                          |                     |                                |        |          |  |  |  |
|                                                                                                                                                                                                                          | 7.2.37                                                                                                                | Special requirements of DCDB:                                                                                                                                                                                                                                                                                                                                                                            |                                |          |             |          |             |                          |                       |                                |        |          |                          |                     |                                |        |          |  |  |  |
| Ref. Doc                                                                                                                                                                                                                 | 1. DCDB shall be provided with 1 no. Alarm module <u>for common alarm</u> of outgoing feeder fault.                   |                                                                                                                                                                                                                                                                                                                                                                                                          |                                |          |             |          |             |                          |                       |                                |        |          |                          |                     |                                |        |          |  |  |  |
|                                                                                                                                                                                                                          | 2. Positive and negative busbars in the DCDB will be completely segregated from each other by sheet steel partitions. |                                                                                                                                                                                                                                                                                                                                                                                                          |                                |          |             |          |             |                          |                       |                                |        |          |                          |                     |                                |        |          |  |  |  |
|                                                                                                                                                                                                                          | 3. Necessary hardware and circuitry for fault alarm and for lamp test and reset.                                      |                                                                                                                                                                                                                                                                                                                                                                                                          |                                |          |             |          |             |                          |                       |                                |        |          |                          |                     |                                |        |          |  |  |  |



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| <p align="center"><b>COPYRIGHT AND CONFIDENTIAL</b></p> <p align="center">The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED.<br/>It must not be used directly or indirectly in any way detrimental to the interest of the company.</p> |          |                                                                                                                                                                     | <p>4. Outgoing feeders will have DC MCCB 'On' and 'Fault' indication lamps, supply supervision relays, lamp test, accept and reset push button through common alarm module.</p> <p>5. Alarm Module: Alarm module for outgoing feeder faults will be provided with switch fuse, alarm accept, reset PBs, 'supply ON' lamp, 'fault detected' lamp, hooter, necessary auxiliary contactors, control circuit for detecting, annunciating, accepting, resetting the fault in any module of the particular bus section. Contacts from this module for common feeder fault and its own module supply failure will be provided and used for annunciation in control desk. Alarm module for incomers/bus coupler faults will be similar to the above except that it will work on 240V AC supply.</p> <p>6. Following indications/alarms will be provided for further taking to DCS in the control room.</p> <ul style="list-style-type: none"> <li>(i) Incomer, bus coupler, ties - ON &amp; OFF</li> <li>(ii) Incomer current and voltage</li> <li>(iii) Alarm module supply failed</li> <li>(iv) Outgoing feeder fault</li> <li>(v) Incomer alarm supply fail</li> <li>(vi) Bus under voltage</li> <li>(vii) Bus earth fault</li> <li>(viii) Bus voltage</li> <li>(ix) DC motor current</li> </ul> <p>7. DC Starters: Calculations for the resistor in the starter panel will be submitted during detailed engineering. <b><u>Closed transition type resistance starter</u></b> will be provided.</p> <p><b>7.3 Numerical Relays &amp; Ethernet Switches</b></p> <p>7.3.1 All the Numerical relays in the PMCC shall be connected in ring topology &amp; each ring shall be connected to required number of redundant (i.e. at least two) managed Ethernet switches (DIN rail mounted or Rack mounted) provided in the Switchboard. The switches shall be further connected in ring and provision for dual redundant communication link from any two switches to DCS shall be available.</p> <p>Each Numerical Relay shall be provided with <i>dual port</i> for ensuring full redundant communication with <i>required number of redundant</i> Ethernet switches, provided in switchboard.</p> <p>Numerical relays shall communicate using IEC 61850 protocol.</p> <p>The communication from Ethernet Switches to upper level control system (DCS) shall be through IEC61850 protocol. Ethernet switch shall have redundant 220V DC Auxiliary supply. All information including time stamp data shall be communicated from Numerical relays to DCS.</p> <p>Ethernet switches shall be suitable for satisfactory operation inside the switchboards taking account of switchboard temperature rise and the site conditions specified. 10% ports in each Ethernet switch shall be kept as spare.</p> <p>7.3.2 The requirement of Numerical relays and integration shall be in compliance with the requirements given in specification of Numerical relays (Annexure-1B).</p> <p>7.3.3 Numerical Relays shall be of latest version, communicable type with non-volatile memory, comprehensive unit providing protection, metering and control.</p> <p>7.3.4 Laptop shall be of the latest configuration and processor as available at the time of purchase subject to approval by BHEL. The minimum configuration shall be i5 processor, 3GHz, 500GB HDD, Windows 7 or higher OS, DVD writer, colour LCD screen or latest available.</p> |                                       |
|                                                                                                                                                                                                                                                                           | Ref. Doc |                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                       |

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| <b>COPYRIGHT AND CONFIDENTIAL</b><br>The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED.<br>It must not be used directly or indirectly in any way detrimental to the interest of the company. |          |                                                                                                                                                                     | <p>7.3.5 The no. of Digital Inputs (DIs) / Digital Outputs (DOs) in the Numerical Relays shall be <i>sufficient</i> for implementing all necessary logics (see Annexure-2A) and providing signals indicated in I/O Lists (see Annexures-4 &amp; 2B). In view of the possibility of change in breaker logics during detailed engineering, <i>20% extra DIs/DOs</i> shall be considered in Numerical Relays over <i>what is deemed sufficient</i> to implement the supplied logic diagrams. No price/time implication on account of change in breaker logics or change in NR DIs/DOs during detailed engineering will be entertained. <i>However, minimum 24 DIs and 12 DOs shall be provided for numerical relays envisaged in incomers and bus couplers and Minimum 12 DIs and 6 DOs shall be provided for numerical relays envisaged in outgoing feeders. Minimum 20% IOs shall be available for future use.</i></p> <p>7.3.6 All cables and associated accessories required for implementing a functional Ethernet Switch with the prescribed architecture shall be provided by the Vendor.</p> <p>All cabling required for the interconnection of Numerical Relays with the Ethernet Switches shall be done at the vendor works itself.</p> <p><u><i>In case, it is not possible to supply the Switchboards to site with all NRs interconnected to the Ethernet Switches and some Interpanel cabling is required to be done at site, then the same shall be done by the Vendor at site without any time and cost implication to BHEL.</i></u></p> <p>7.3.7 <b>RTC of Numerical relay</b> shall be synchronized with plant clock of upstream system <b>on NTP or IRIG-B</b> (to be decided during detailed engineering).</p> <p><b>8.0 INSPECTION, TESTING AND ACCEPTANCE</b></p> <p>8.1 Inspection, testing and acceptance requirements shall confirm to Standard Specifications of LT switchboard and Numerical Relays. Inspection procedure for LT switchboards shall be as per Annexure-9.</p> <p>8.2 Before raising inspection call, manufacturer shall submit all the test reports/ certificates for the equipment.</p> <p>8.3 During fabrication, the switchgear package shall be subjected to inspection by Owner or by an agency authorized by the Owner. Manufacturer shall furnish all necessary information concerning the supply to Owner's inspectors. Owner/BHEL may make multiple visits during manufacturing and testing for review of progress, quality documents verification, verification of materials in compliance to specifications/standards. Owner/BHEL may make final visit for final inspection and verification of shipment documents. The same shall be included in the manufacturing quality assurance plan. Actual visits and inspection shall be as per the approved manufacturing quality assurance plan.</p> <p>8.4 All routine and acceptance tests as per IS standards and Standard Manufacturing Quality Plan shall be carried out at manufacturer's works under his care and expense.</p> <p>8.5 All equipments supplied by vendor shall be of proven design and shall be type tested as per IS standards. The requisite type test certificates shall be submitted during technical bid submission and type test certificates shall not be older than 5 years from the date of bid submission. In case valid test certificates are not available or are older than 5 years, vendor shall conduct tests free of cost and without any delivery implications. In case BHEL / Customer / Consultant insist the tests, the tests shall be done with price implication. Unit rates shall be quoted by vendor.</p> |                                                                                                                                                                                                                                                                 |
|                                                                                                                                                                                                                                 | Ref. Doc |                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <p>8.6 For Numerical Relays, the following tests shall be performed and/ or Test Certificates submitted for concurrence by BHEL:</p> <ol style="list-style-type: none"> <li>1. Temperature withstand</li> <li>2. Electromagnetic compatibility (EMC)</li> </ol> |

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|                                                                                                                                                                                                                                                                                                                                                                           | <div>9.0DOCUMENTATION</div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                              |               |
|                                                                                                                                                                                                                                                                                                                                                                           | <div>9.1Documents to be submitted along with the technical bid/ offer:<div><div>1. Deviation schedule (Refer Annexure-8)</div><div>2. Switchboard wise GA with dimensions and weights</div><div>3. Un-priced price format (Refer Annexure-10)</div><div>4. Type test certificates as per IS standards not older than 5 years (at least for Short circuit, Temperature rise, IP class and Internal Arc Test) for switchboards which are similar in configuration to the switchboards present in this Project.</div><div>5. Check List (Refer Annexure-15). Details are specified at Cl. 14.0 of this specification.</div></div></div> |                                                                              |               |
|                                                                                                                                                                                                                                                                                                                                                                           | <div>Technical offer of the bidder will be evaluated only on the basis of deviation schedule and Price Format. Nature of Deviations shall only be of Design/ Manufacturing constraints and non-availability of items/ components/ makes in market.</div>                                                                                                                                                                                                                                                                                                                                                                             |                                                                              |               |
|                                                                                                                                                                                                                                                                                                                                                                           | <div>Switchboard dimensions are for fixing Purchaser’s tentative room layout. Un-priced price format consists of Items of Main offer and Unit rates for additions/ deletions of supplies/ services/ spares during execution. All fields shall be quoted in this format only.</div>                                                                                                                                                                                                                                                                                                                                                   |                                                                              |               |
|                                                                                                                                                                                                                                                                                                                                                                           | <div>Note: No price implications shall be entertained for deviations withdrawn during the technical scrutiny. If any deviation is accepted by BHEL during technical scrutiny even then there will be no price implication. Hence, in no case there will be consideration of price implications.</div>                                                                                                                                                                                                                                                                                                                                |                                                                              |               |
|                                                                                                                                                                                                                                                                                                                                                                           | <div>9.2Offer is liable for rejection when<div><div>The offer is incomplete with respect to above clauses.</div><div>The above documents are not submitted in BHEL’s formats.</div><div>Any field is left blank in the Price format.</div><div>Discrepancy is observed between Un-priced and Priced bid.</div></div></div>                                                                                                                                                                                                                                                                                                           |                                                                              |               |
|                                                                                                                                                                                                                                                                                                                                                                           | <div>9.3Documents to be submitted after award of contract: Refer Annexure - 13.</div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                              |               |
|                                                                                                                                                                                                                                                                                                                                                                           | <div>10.0GUARANTEE</div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                              |               |
|                                                                                                                                                                                                                                                                                                                                                                           | <div>10.1The supplier shall be fully responsible in respect of design, selection of components, manufacture, and quality of workmanship and operation of all the equipments, accessories etc. supplied under this scope of contract up to the Guarantee period.</div>                                                                                                                                                                                                                                                                                                                                                                |                                                                              |               |
| <div>10.2Guarantee period shall be as per the commercial terms and conditions of the NIT.</div>                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                              |               |
| <div>11.0QUALITY PLAN</div>                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                              |               |
| <div>11.1Quality Assurance Program</div>                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                              |               |
| <div>11.1.1The successful Bidder shall provide and implement a documented Quality Assurance Programme. The Program shall be capable of providing assurance that design, purchasing, manufacturing, loading, shipping, storage, erection, construction, testing and examination of Scope of Supply comply with the requirements of the specifications and documents.</div> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                              |               |
| Ref. Doc                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                              |               |

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| <div><div><div>COPYRIGHT AND CONFIDENTIAL</div><div>The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED.<br/>It must not be used directly or indirectly in any way detrimental to the interest of the company.</div></div><div><div>11.1.2</div><div>The quality control organization shall follow-up the inspection and testing to ensure adherence to quality of the Scope of Supply and compliance with the Program and with the test procedures. In particular, it shall:<div><div>1. Provide all design and engineering Divisions and its Sub vendor with detailed instructions regarding inspection and testing;</div><div>2. Organise the tests required in the programme, witness them and issue test certificates;</div><div>3. Inspect the Equipment before packing, check the quality of packing and if Equipment and packing are found to comply with the requirements, authorise shipment;</div><div>4. Inspect for possible transport damages if any, and prepare and submit repair procedures for approval;</div><div>5. Organise and witness all inspection and testing on Site and issue test certificates.</div></div></div></div><div><div>11.1.3</div><div>No Equipment shall be packed, prepared for shipment, or dismantled for the purpose of packing for shipment, unless it has been satisfactorily inspected and approved for shipment.</div></div><div><div>11.2</div><div><b>Quality Assurance Manual</b><div>The successful Bidder's Quality Assurance Program shall be documented in a Quality Assurance Manual. A copy of the Quality Assurance Manual shall be submitted for review and comment.</div></div></div><div><div>11.3</div><div><b>Quality Management System</b><div><div>11.3.1</div><div>Successful Bidder Quality Management System shall meet the requirements of ISO 9001, "Quality Systems – Model for quality assurance in design / development, production, installation and servicing". The successful Bidder shall demonstrate compliance with this requirement.</div></div><div><div>11.3.2</div><div>Quality Assurance:<div><div>1. All routine tests shall be conducted on the equipment at supplier's works.</div><div>2. All tests will be witnessed by BHEL and / or BHEL's customer as per the approved QAP. Hence test procedures, list of tests to be conducted shall be submitted as per the documentation schedule.</div></div></div></div></div></div><div><div>12.0</div><div><b>PACKING AND DISPATCH</b><div><div>12.1</div><div>All the equipments shall be divided into several shipping sections for protection and ease of handling during transportation. The equipment shall be properly packed for selected mode of transportation i.e. by ship / rail or trailer. The panels shall be wrapped in polyethylene sheets before being placed in wooden cases to prevent damage to the finish. Cases shall have skid bottoms for handling. Cases shall be suitable for lifting by cranes. Special precaution notations such as Fragile, This side up, center of gravity, weight, Owner's particulars, Purchase order number etc. shall be clearly marked on the package together with other details as per purchase order.</div></div><div><div>12.2</div><div>The commissioning spare items, mandatory spare items, tools &amp; tackles and cable glands &amp; lugs shall be separately packed. Each packet shall have its respective label on the outside for clear identification.</div></div><div><div>12.3</div><div>The <i>detailed</i> packing list shall be furnished for BHEL's review and acceptance before seeking dispatch clearance. Vendor shall dispatch the panels generally with all components mounted. If, for reason of preventing transit damage or for any other reasons, the components/ items have to be packed separately and dispatched then such loose items have also to be listed in the packing list. The list shall have references duly tracing them to</div></div></div></div></div> |          |                                                                                                                                                                     |                                                                              |               |
| Ref. Doc                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |          |                                                                                                                                                                     |                                                                              |               |

| TD-201<br>Rev No. 00<br>Form No.                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>PRODUCT STANDARD</b><br>PROJECT ENGINEERING & SYSTEMS DIVISION, HYDERABAD | <b>PY55223</b> |               |             |          |               |    |           |       |              |    |             |       |              |    |                      |       |              |    |             |       |              |    |          |       |              |    |           |       |              |    |                          |        |              |    |                          |        |              |    |                                          |       |              |    |                                      |       |              |    |         |  |  |    |                                         |       |              |
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| COPYRIGHT AND CONFIDENTIAL<br>The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED. It must not be used directly or indirectly in any way detrimental to the interest of the company. | <p>the respective packing box/ crate. If such loose items are not declared then it shall be deemed that there are no such loose items.</p> <p>12.4 The equipment may be stored outdoors for long periods before installation. The packing should be suitable for outdoor storage in areas with heavy rains and high ambient temperature unless otherwise agreed.</p> <p><b>13.0 SPECIAL CONDITIONS</b></p> <p>13.1 Bidder should confirm that “after-sales service” facilities will be made available free of cost for proper commissioning/ maintenance of equipments offered. The vendor should depute their Technician/ Engineer at their cost for rectification of any defects during guarantee/ warranty period.</p> <p>13.2 Bidder should furnish particulars of their factory or workshop including location and machinery installed with the capacities for manufacturing of the switchgear. Parties who do not have established manufacturing facilities need not quote for the tender.</p> <p>13.3 Vendor to confirm that all equipments supplied by vendor are of proven design and are type tested. The requisite type test certificates shall be submitted during technical bid submission/ detailed engineering &amp; type test certificates shall not be older than 5 years from the date of bid submission. In case valid test certificates are not available or are older than 5 years, vendor shall conduct tests free of cost &amp; without any delivery implications. In case BHEL / Customer / Consultant insist the tests, the tests shall be done with price implication. Unit rates shall be quoted by vendor.</p> <p>13.4 All cabling required for the interconnection of Numerical Relays with the Ethernet Switches in PMCCs and MCCs, shall be done at the vendor works itself.</p> <p>In case, it is not possible to supply the Switchboards to site with all NRs interconnected to the Ethernet Switches and some Interpanel cabling is required to be done at site, then the same shall be done by the Vendor at site without any time and cost implication to BHEL.</p> <p><b>14.0 CHECK LIST FOR BID SUBMISSION</b></p> <p>14.1 Check List for Bid Submission is provided as Annexure-15 to this Specification.</p> <p>This Check List shall be followed for submitting the Bid documents. The Check List itself <i>shall be filled</i> by the Bidder in entirety and <i>mandatorily submitted</i> along with the Offer.</p> <p style="text-align: center;"><b><u>LIST OF MATERIAL CODES AS PER ENQUIRY</u></b></p> <table border="1"> <thead> <tr> <th>Variant no.</th> <th>Description</th> <th>Quantity</th> <th>Material code</th> </tr> </thead> <tbody> <tr> <td>01</td> <td>415V PMCC</td> <td>1 no.</td> <td>PY9755223010</td> </tr> <tr> <td>02</td> <td>415V TG MCC</td> <td>1 no.</td> <td>PY9755223029</td> </tr> <tr> <td>03</td> <td>415V Water System DB</td> <td>1 no.</td> <td>PY9755223037</td> </tr> <tr> <td>04</td> <td>415V MOV DB</td> <td>1 no.</td> <td>PY9755223045</td> </tr> <tr> <td>05</td> <td>415V PDB</td> <td>1 no.</td> <td>PY9755223053</td> </tr> <tr> <td>06</td> <td>220V DCDB</td> <td>1 no.</td> <td>PY9755223061</td> </tr> <tr> <td>07</td> <td>Wall mounted DB Type-3AC</td> <td>2 nos.</td> <td>PY9755223070</td> </tr> <tr> <td>08</td> <td>Wall mounted DB Type-1AC</td> <td>2 nos.</td> <td>PY9755223088</td> </tr> <tr> <td>09</td> <td>Commissioning Spares and Tools &amp; Tackles</td> <td>1 set</td> <td>PY9755223096</td> </tr> <tr> <td>10</td> <td>Laptop, Software CD and Software Key</td> <td>1 no.</td> <td>PY9755223100</td> </tr> <tr> <td>11</td> <td>Deleted</td> <td></td> <td></td> </tr> <tr> <td>12</td> <td>Mod./Addl job on LT Swgr at site by OEM</td> <td>1 set</td> <td>PY9755223126</td> </tr> </tbody> </table> |                                                                              |                | Variant no.   | Description | Quantity | Material code | 01 | 415V PMCC | 1 no. | PY9755223010 | 02 | 415V TG MCC | 1 no. | PY9755223029 | 03 | 415V Water System DB | 1 no. | PY9755223037 | 04 | 415V MOV DB | 1 no. | PY9755223045 | 05 | 415V PDB | 1 no. | PY9755223053 | 06 | 220V DCDB | 1 no. | PY9755223061 | 07 | Wall mounted DB Type-3AC | 2 nos. | PY9755223070 | 08 | Wall mounted DB Type-1AC | 2 nos. | PY9755223088 | 09 | Commissioning Spares and Tools & Tackles | 1 set | PY9755223096 | 10 | Laptop, Software CD and Software Key | 1 no. | PY9755223100 | 11 | Deleted |  |  | 12 | Mod./Addl job on LT Swgr at site by OEM | 1 set | PY9755223126 |
|                                                                                                                                                                                                                       | Variant no.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Description                                                                  | Quantity       | Material code |             |          |               |    |           |       |              |    |             |       |              |    |                      |       |              |    |             |       |              |    |          |       |              |    |           |       |              |    |                          |        |              |    |                          |        |              |    |                                          |       |              |    |                                      |       |              |    |         |  |  |    |                                         |       |              |
| 01                                                                                                                                                                                                                    | 415V PMCC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1 no.                                                                        | PY9755223010   |               |             |          |               |    |           |       |              |    |             |       |              |    |                      |       |              |    |             |       |              |    |          |       |              |    |           |       |              |    |                          |        |              |    |                          |        |              |    |                                          |       |              |    |                                      |       |              |    |         |  |  |    |                                         |       |              |
| 02                                                                                                                                                                                                                    | 415V TG MCC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1 no.                                                                        | PY9755223029   |               |             |          |               |    |           |       |              |    |             |       |              |    |                      |       |              |    |             |       |              |    |          |       |              |    |           |       |              |    |                          |        |              |    |                          |        |              |    |                                          |       |              |    |                                      |       |              |    |         |  |  |    |                                         |       |              |
| 03                                                                                                                                                                                                                    | 415V Water System DB                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 1 no.                                                                        | PY9755223037   |               |             |          |               |    |           |       |              |    |             |       |              |    |                      |       |              |    |             |       |              |    |          |       |              |    |           |       |              |    |                          |        |              |    |                          |        |              |    |                                          |       |              |    |                                      |       |              |    |         |  |  |    |                                         |       |              |
| 04                                                                                                                                                                                                                    | 415V MOV DB                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1 no.                                                                        | PY9755223045   |               |             |          |               |    |           |       |              |    |             |       |              |    |                      |       |              |    |             |       |              |    |          |       |              |    |           |       |              |    |                          |        |              |    |                          |        |              |    |                                          |       |              |    |                                      |       |              |    |         |  |  |    |                                         |       |              |
| 05                                                                                                                                                                                                                    | 415V PDB                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 1 no.                                                                        | PY9755223053   |               |             |          |               |    |           |       |              |    |             |       |              |    |                      |       |              |    |             |       |              |    |          |       |              |    |           |       |              |    |                          |        |              |    |                          |        |              |    |                                          |       |              |    |                                      |       |              |    |         |  |  |    |                                         |       |              |
| 06                                                                                                                                                                                                                    | 220V DCDB                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1 no.                                                                        | PY9755223061   |               |             |          |               |    |           |       |              |    |             |       |              |    |                      |       |              |    |             |       |              |    |          |       |              |    |           |       |              |    |                          |        |              |    |                          |        |              |    |                                          |       |              |    |                                      |       |              |    |         |  |  |    |                                         |       |              |
| 07                                                                                                                                                                                                                    | Wall mounted DB Type-3AC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 2 nos.                                                                       | PY9755223070   |               |             |          |               |    |           |       |              |    |             |       |              |    |                      |       |              |    |             |       |              |    |          |       |              |    |           |       |              |    |                          |        |              |    |                          |        |              |    |                                          |       |              |    |                                      |       |              |    |         |  |  |    |                                         |       |              |
| 08                                                                                                                                                                                                                    | Wall mounted DB Type-1AC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 2 nos.                                                                       | PY9755223088   |               |             |          |               |    |           |       |              |    |             |       |              |    |                      |       |              |    |             |       |              |    |          |       |              |    |           |       |              |    |                          |        |              |    |                          |        |              |    |                                          |       |              |    |                                      |       |              |    |         |  |  |    |                                         |       |              |
| 09                                                                                                                                                                                                                    | Commissioning Spares and Tools & Tackles                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 1 set                                                                        | PY9755223096   |               |             |          |               |    |           |       |              |    |             |       |              |    |                      |       |              |    |             |       |              |    |          |       |              |    |           |       |              |    |                          |        |              |    |                          |        |              |    |                                          |       |              |    |                                      |       |              |    |         |  |  |    |                                         |       |              |
| 10                                                                                                                                                                                                                    | Laptop, Software CD and Software Key                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 1 no.                                                                        | PY9755223100   |               |             |          |               |    |           |       |              |    |             |       |              |    |                      |       |              |    |             |       |              |    |          |       |              |    |           |       |              |    |                          |        |              |    |                          |        |              |    |                                          |       |              |    |                                      |       |              |    |         |  |  |    |                                         |       |              |
| 11                                                                                                                                                                                                                    | Deleted                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                              |                |               |             |          |               |    |           |       |              |    |             |       |              |    |                      |       |              |    |             |       |              |    |          |       |              |    |           |       |              |    |                          |        |              |    |                          |        |              |    |                                          |       |              |    |                                      |       |              |    |         |  |  |    |                                         |       |              |
| 12                                                                                                                                                                                                                    | Mod./Addl job on LT Swgr at site by OEM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 1 set                                                                        | PY9755223126   |               |             |          |               |    |           |       |              |    |             |       |              |    |                      |       |              |    |             |       |              |    |          |       |              |    |           |       |              |    |                          |        |              |    |                          |        |              |    |                                          |       |              |    |                                      |       |              |    |         |  |  |    |                                         |       |              |
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## PRODUCT STANDARD

PROJECT ENGINEERING &amp; SYSTEMS DIVISION, HYDERABAD

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