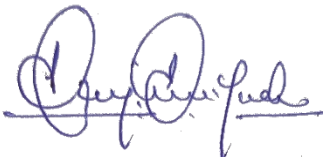






# Technical Specification of Monoblock and Tray



**Bharat Heavy Electricals Limited**  
**Corporate Research & Development Division**  
**Vikas Nagar, Hyderabad- 500093, India**

Prepared by:  Krishna Kumar Yadav BHEL R&D	Checked by:  D Pavitran BHEL R&D	Approved by:  (G. RAGHAVENDER RAO) G R Rao (BHEL R&D)	Date: 03-08-2022
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## 1. RECORD OF REVISIONS

REV.NO.	DATE	REVISION DETAILS	REVISED	APPROVED
00	03.08.2022	New Specification	Krishna Kumar Yadav	G R Rao

## 2. Purpose and Scope

This document defines the technical specification of the Monoblock and Tray.

## 3. Specification

### 3.1 Monoblock

Sl.No	Description	BHEL Specification																																	
1	Raw Material	<p>Vendor should use Aluminium Alloy AA6061 T6/T651 as per AMS-4027 (chemical composition given below):</p> <table border="1"> <thead> <tr> <th>Component</th> <th>Min (%)</th> <th>Max (%)</th> </tr> </thead> <tbody> <tr> <td>Magnesium (Mg)</td> <td>0.8</td> <td>1.2</td> </tr> <tr> <td>Silicon (Si)</td> <td>0.4</td> <td>0.8</td> </tr> <tr> <td>Iron (Fe)</td> <td>0</td> <td>0.7</td> </tr> <tr> <td>Copper (Cu)</td> <td>0.15</td> <td>0.4</td> </tr> <tr> <td>Chromium (Cr)</td> <td>0.04</td> <td>0.35</td> </tr> <tr> <td>Zinc (Zn)</td> <td>0</td> <td>0.25</td> </tr> <tr> <td>Manganese (Mn)</td> <td>0</td> <td>0.15</td> </tr> <tr> <td>Titanium (Ti)</td> <td>0</td> <td>0.15</td> </tr> <tr> <td>Others (total)</td> <td>0</td> <td>0.15</td> </tr> <tr> <td>Others (each)</td> <td>0</td> <td>0.05</td> </tr> </tbody> </table> <p>The vendor should submit the following Test certificates to BHEL for verification before proceeding for manufacturing.</p> <ol style="list-style-type: none"> <li>Material Chemical composition test certificate from NABL accredited Lab: Chemical composition should confirm to the material specification as per the respective standard.</li> <li>Material Hardness test certificate from NABL accredited Lab: as per ASTM E10.</li> <li>Material Tensile properties test certificate: Tensile test should be done as per ASTM E8. Test report should include: UTS, 0.2% Proof test &amp; percentage elongation.</li> <li>Material Ultrasonic inspection test certificate: UT in accordance with ASTM B 594-90 class A</li> </ol>	Component	Min (%)	Max (%)	Magnesium (Mg)	0.8	1.2	Silicon (Si)	0.4	0.8	Iron (Fe)	0	0.7	Copper (Cu)	0.15	0.4	Chromium (Cr)	0.04	0.35	Zinc (Zn)	0	0.25	Manganese (Mn)	0	0.15	Titanium (Ti)	0	0.15	Others (total)	0	0.15	Others (each)	0	0.05
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Others (each)	0	0.05																																	
2	Manufacturing of Monoblock	Machining shall be done as per drawing no: 0-PM-45-01001(2 sheets)																																	
3	Ports	Threaded Ports as mentioned in drawing no: 0-PM-45-01001 (2 sheets) should be provided. Required taps should be procured by Vendor.																																	
4	Plugs Manufacturing	Manufacturing of Plugs as per drawing no: 4-PM-45-01002, 4-PM-45-01003 and 4-PM-45-01004																																	
5	Engraving	Engrave the Part as shown in Part No: 3-PM-45-01000, Sl. No: 00X (X should start from 1). Maximum 0.2mm deep.																																	
6	Chromate Conversion	Chromate conversion as per <b>MIL-DTL-5541F CLASS 1A</b> should be done on the Monoblock and plug.																																	
5	Assembly	Assembly of Plugs and Welding in Monoblock as per Assembly drawing no: 3-PM-45-01000. Welding material is mentioned in assembly drawing. Before start of Welding, vendor shall qualify its welding process in																																	

		accordance with ASME Section IX from reputed TPIAs like Lloyds, BVI, TUV, etc. and shall submit the following evidences to BHEL for verification. 1) Welding Procedure Specification (WPS) 2) Procedure Qualification Record (PQR) 3) Welder Performance Qualification (WPQ).
6	Proof Pressure test	After Plug assembly & welding, Proof pressure test (PPT) should be done with Water at <b>12.75 bar for 2 minutes</b> . Dummy Plugs for closing open threaded ports should be manufactured by Vendor for Proof pressure test. Equipment for PPT should be arranged by Vendor. If any leakages are found during PPT, vendor should carry out welding at those locations and should carry out PPT again until it is leak proof.
7	Plating	After successful Proof Pressure test, Electro-Nickel Plating should be done as per <b>MIL-C-20674 CLASS 2, THICKNESS 12-15 MICRONS</b> , on Monoblock Assembly. Suitable plugs for closing open threaded Ports for Electro-Nickel Plating should be manufactured by vendor. Vendor should carry out retapping or repair if any damages are found in threaded ports after nickel plating.
8	Helical inserts	Helical inserts screw locking type should be provided in locations as per drawing no: 0-PM-45-01001. Inserts should comply to <b>MS/NASM Part No: MA3329, Material: SS304</b>
9	Documents	Following documents shall be submitted to BHEL for verification: a. Material Chemical composition test certificate from NABL accredited Lab: Chemical composition should confirm to the material specification as per the respective standard. b. Material Hardness test certificate from NABL accredited Lab : as per ASTM E10 c. Material Tensile properties test certificate: Tensile test should be done as per ASTM E8. Test report should include: UTS, 0.2% Proof test & percentage elongation. d. Material Ultrasonic inspection test certificate: Shall be done as per ASTM B 594-90 class A e. Welding Procedure Specification (WPS), Procedure Qualification Record (PQR) & Welder Performance Qualification (WPQ) should be submitted prior to start of Welding. f. Chromate conversion certificate. g. Proof Pressure test certificate. h. Electro-Nickel-Plating certificate. i. Dimensional reports of Monoblock and Plugs
10	Warranty	12 months warranty from the date of acceptance at BHEL Corporate R&D
11	Delivery	Within 12 weeks after placement of order.

### 3.2 Tray

Sl.No	Description	BHEL Specification																																	
1	Material	<p>Vendor should use Aluminium Alloy AA7075 T6 as per QQ-A-250/12E or equivalent AMS standard (chemical composition given below):</p> <table border="1"> <thead> <tr> <th>Component</th> <th>Min (%)</th> <th>Max (%)</th> </tr> </thead> <tbody> <tr> <td>Magnesium (Mg)</td> <td>2.1</td> <td>2.9</td> </tr> <tr> <td>Silicon (Si)</td> <td>0</td> <td>0.5</td> </tr> <tr> <td>Iron (Fe)</td> <td>0</td> <td>0.7</td> </tr> <tr> <td>Copper (Cu)</td> <td>1.2</td> <td>2.0</td> </tr> <tr> <td>Chromium (Cr)</td> <td>0.18</td> <td>0.40</td> </tr> <tr> <td>Zinc (Zn)</td> <td>5.1</td> <td>6.1</td> </tr> <tr> <td>Manganese (Mn)</td> <td>0</td> <td>0.3</td> </tr> <tr> <td>Titanium (Ti)</td> <td>0</td> <td>0.2</td> </tr> <tr> <td>Others (total)</td> <td>0</td> <td>0.15</td> </tr> <tr> <td>Others (each)</td> <td>0</td> <td>0.05</td> </tr> </tbody> </table> <p>The vendor should submit the following certificates to BHEL for verification before proceeding for performing manufacturing operation:</p> <ol style="list-style-type: none"> <li>Material Chemical composition test certificate from NABL accredited Lab: Chemical composition should confirm to the material specification as per the respective standard.</li> <li>Material Hardness test certificate from NABL accredited Lab: as per ASTM E10.</li> <li>Material Tensile properties test certificate: Tensile test should be done as per ASTM E8. Test report should include: UTS, 0.2% Proof test &amp; percentage elongation.</li> <li>Material Ultrasonic inspection test certificate: Shall be done as per ASTM B 594-90 class A</li> </ol>	Component	Min (%)	Max (%)	Magnesium (Mg)	2.1	2.9	Silicon (Si)	0	0.5	Iron (Fe)	0	0.7	Copper (Cu)	1.2	2.0	Chromium (Cr)	0.18	0.40	Zinc (Zn)	5.1	6.1	Manganese (Mn)	0	0.3	Titanium (Ti)	0	0.2	Others (total)	0	0.15	Others (each)	0	0.05
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2	Manufacturing of Tray	Machining as per drawing no: 0-PM-45-01002																																	
3	Engraving	Engrave the Part as shown in Part No: 0-PM-45-01002, Sl. No: 00X (X should start from 1). Maximum 0.2 mm deep.																																	
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		done as per ASTM E8. Test report should include: UTS, 0.2% Proof test & percentage elongation. d. Material Ultrasonic inspection test certificate: Shall be done as per ASTM B 594-90 class A e. Chromate conversion certificate. f. Electro-Nickel-Plating certificate. g. Dimensional reports
7	Warranty	12 months warranty from the date of acceptance at BHEL Corporate R&D
8	Delivery	Within 12 weeks after placement of order.

#### 4. Quality Assurance Requirements

- a) Vendor shall submit the Manufacturing Quality Plan (MQP) to BHEL for approval within a week from placement of order.
- b) Vendor shall arrange for BHEL inspection of Monoblock and tray as per the Approved Manufacturing Quality Plan.
- c) Vendor shall raise inspection request to BHEL with minimum 3 days (working days) advance notice to inspection date.
- d) Vendor to submit Mill Test Certificate (MTC) of raw materials. In absence of MTC, vendor to arrange for Sample testing witness by BHEL.
- e) Nondestructive Examination (NDE), if applicable is to be performed by Level-II Qualified Personnel only.
- f) Vendor to arrange for Qualification of Welding Procedure in accordance with ASME Section IX and submit Welding Procedure Specification (WPS), Procedure Qualification Record (PQR), Welder Performance Qualification (WPQ) to BHEL.
- g) All instruments used in inspection and testing shall be calibrated at NABL accredited Laboratories.
- h) Mechanical/ Chemical Tests shall be carried out at NABL accredited Laboratories.
- i) Reference Quality Assurance Plan is enclosed.