

**अंतरिक्षयान पोजीशनर मॉडल-आई13के के लिए इच्छा की अभिव्यक्ति (ईओआई) के लिए आमंत्रण:**  
**के – संदर्भ में**

**Invitation for Expression of Interest [EOI] for SPACECRAFT POSITIONER MODEL-13K - reg**

अंतरिक्षयान पोजीशनर मॉडल-आई13के को भौतिक मापदंड मशीन पर अंतरिक्ष यान के द्रव्यमान गुणों (जैसे, द्रव्यमान, गुरुत्वाकर्षण केंद्र, जड़त्व आघूर्ण और जड़त्व गुणनफल) के मापन के लिए, अंतरिक्ष यान को आवश्यक अभिविन्यासों में रखने के लिए डिज़ाइन किया गया है। यह अंतरिक्ष यानों को जड़त्व आघूर्ण के मापन के लिए, जड़त्व गुणनफल की गणना करने के उद्देश्य से, मनमाने ऑर्थोगोनल अक्षों के अनुदिश रखने में भी सक्षम बनाता है।

Spacecraft Positioner Model–13K is designed to position the S/C at required orientations for the measurement of its Mass properties (viz., mass, centre of gravity, mass moment of inertia and product of inertia) on Physical Parameters Machine. It also enables positioning of S/Cs along arbitrary orthogonal set of axes for the measurement of moments of inertia to compute products of inertia.

भारतीय अंतरिक्ष अनुसंधान संगठन (इसरो) के अंतर्गत, अंतरिक्ष विभाग, भारत सरकार द्वारा संचालित यू. आर. राव उपग्रह केंद्र (यूआरएससी), इसरो का एक प्रमुख केंद्र है, जो डिजाइन और विकास के कार्यों का नेतृत्व करता है।

U. R. Rao Satellite Centre [URSC], of Indian Space Research Organization [ISRO] under Department of Space, Government of India is the lead Centre of ISRO for Design, Development.

यह प्रस्तावित है कि अंतरिक्षयान पोजीशनर मॉडल-13के के विकास के लिए इच्छा की अभिव्यक्ति के लिए निविदा आमंत्रित की जाए। उन संभावित संस्थानों/विक्रेताओं से अनुरोध किया जाता है जिनके पास पर्याप्त विशेषज्ञता, अनुभव और मजबूत वित्तीय पृष्ठभूमि है, कि वे इस परियोजना में अपनी इच्छा व्यक्त करें।"

It is proposed to invite Expression of Interest for development of for realization of Spacecraft Positioner Model–13K. Potential Establishment[s]/ Vendor[s] having sufficient know-how, experience/expertise and sound financial background are invited to express their interest for the same.

"ईओआई के दस्तावेज़ हमारी वेबसाइट [www.isro.gov.in](http://www.isro.gov.in) से डाउनलोड किए जा सकते हैं।"

EOI documents can be downloaded from our website [www.isro.gov.in](http://www.isro.gov.in)

"ईओआई का मूल्यांकन बोली लगाने वाले की अनुभव, सेवाओं के दायरे की उसकी समझ, अवसंरचना, प्रस्तावित पद्धति और कार्य योजना, कुशल कार्यबल और उद्योग की वित्तीय स्थिति के आधार पर किया जाएगा। इसके अतिरिक्त, अंतरिक्ष यान पोजिशनिंग मॉडल-13के के निर्माण के लिए मजबूत इंजीनियरिंग, डिजाइन और विश्लेषण पृष्ठभूमि वाले भारतीय उद्योगों पर विचार किया जाएगा।"

The EOI will be evaluated on the basis of bidder's experience, its understanding of scope of services, facility infrastructure, proposed methodology and work plan, skilled manpower and the financial strength of the industry. Also Indian Industry with strong

engineering, design and analysis background for the delivery of Spacecraft Positioner Model–13K.

यू.आर. राव उपग्रह केंद्र बेंगलूरु द्वारा एक प्रारंभिक बैठक आयोजित की जाएगी, जिसका उद्देश्य गतिविधियों को बेहतर ढंग से समझना और किसी भी संदेह को दूर करना है।

A Pre-Eol meeting will be arranged by U.R. Rao Satellite Centre, Bengaluru in order to have a better understanding of the activities involved, clarify doubts, if any.

यूआरएससी के पास ईओआई की प्रक्रिया को रद्द करने या फिर से जारी करने का अधिकार है, यदि इसकी आवश्यकता हो, या अतिरिक्त जानकारी/विवरण प्राप्त करने का अधिकार है।

URSC reserves the right to cancel/re-issue the process of EOI if the necessity so arises or to seek further information / details.

इसके बाद, विक्रेता(ओं) को इच्छा की अभिव्यक्ति के जवाब के साथ निम्नलिखित जानकारी का विस्तृत विवरण जमा करना होगा:

Subsequently, the vendor(s) shall submit the response to Expression of Interest along with the following information in detail:

|    |                                                                                                                                                                                                                                                                                                                                            |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | Registered address of the company with Phone, Fax, Email, Web etc.<br>कंपनी का पंजीकृत पता, जिसमें फोन नंबर, फैक्स नंबर, ईमेल पता, वेबसाइट आदि शामिल हैं।                                                                                                                                                                                  |
| 2. | Company/Organization Status (PSU / Proprietary/MSME/ Partnership / Private Ltd., etc.) with Name and Address of Proprietor, Partners, Board of Directors etc.<br>कंपनी/संगठन की स्थिति (सार्वजनिक क्षेत्र का उपक्रम / स्वामित्व / एमएसएमई / साझेदारी / निजी लिमिटेड, आदि) के साथ-साथ प्रोपराइटर, भागीदारों, निदेशक मंडल आदि के नाम और पते। |
| 3. | Associates: (a) Indian (b) Foreign. Percentage of business partnership (if any).<br>"सहयोगी: (अ) भारतीय (ब) विदेशी। व्यवसायिक साझेदारी का प्रतिशत (यदि कोई हो)।"                                                                                                                                                                           |
| 4. | List of Major Current Customers with full address and their Contact/Details.<br>प्रमुख वर्तमान ग्राहकों की सूची, जिसमें उनका पूरा पता और संपर्क जानकारी/विवरण शामिल है।                                                                                                                                                                    |
| 5. | Details of Infrastructure Facilities owned / available.<br>"बुनियादी सुविधाओं की जानकारी, जो उपलब्ध हैं या जिनका स्वामित्व है।"                                                                                                                                                                                                            |
| 6. | Names and addresses of the major shareholders of the Company and the percentage of their share capital.<br>कंपनी के प्रमुख शेयरधारकों के नाम और पते, साथ ही उनके स्वामित्व वाले शेयरों का प्रतिशत।                                                                                                                                         |

|     |                                                                                                                                                                                                                           |
|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7.  | Capital and Turnover for the preceding Three Financial years with copy of latest Annual report.<br>"पिछले तीन वित्तीय वर्षों के लिए पूंजी और कारोबार की जानकारी, साथ ही नवीनतम वार्षिक रिपोर्ट की प्रतिलिपि संलग्न करें।" |
| 8.  | Financial Capacity / Credit facilities available.<br>वित्तीय क्षमता/उपलब्ध क्रेडिट सुविधाएं।                                                                                                                              |
| 9.  | Name and Address of Bankers. "बैंकर्स के नाम और पते।"                                                                                                                                                                     |
| 10. | Trade Association to which industry belongs to<br>वह व्यापार संघ जिससे कोई उद्योग जुड़ा हुआ है।                                                                                                                           |
| 11. | Establishment/Sales/GST Registration and PAN Number.<br>स्थापना/बिक्री/जीएसटी पंजीकरण और पैन नंबर।                                                                                                                        |
| 12. | Nature of Business व्यवसाय का स्वरूप                                                                                                                                                                                      |
| 13. | Solvency/Financial capacity of the Firm issued by their bankers<br>फर्म की वित्तीय क्षमता/भुगतान क्षमता का प्रमाण पत्र, जो उनके बैंकों द्वारा जारी किया गया है।                                                           |
| 14. | Any other information of the industries/ies considered relevant.<br>किसी भी अन्य जानकारी जो उद्योगों/उद्योगों के संबंध में प्रासंगिक मानी जाती हो।                                                                        |
| 15. | The profile of the Company/ies clearly bringing out the area of Strength and weaknesses. कंपनी/कंपनियों की प्रोफाइल स्पष्ट रूप से उनकी ताकत और कमजोरियों के क्षेत्रों को दर्शाती है।                                      |
| 16. | Self-Assessment Technical and Organisational competence to take part in the EOI<br>स्व-मूल्यांकन: ईओआई (EOI) में भाग लेने के लिए आवश्यक तकनीकी और संगठनात्मक क्षमता का मूल्यांकन।                                         |
| 17. | Response forms as mentioned in the EOI<br>"ईओआई (EOI) में उल्लिखित प्रतिक्रिया प्रपत्र।"                                                                                                                                  |

### ईओआई से पहले की बैठक Pre-Eoi Meeting:

यू.आर. राव उपग्रह केंद्र बेंगलुरु द्वारा एक प्रारंभिक बैठक (प्री-ईओआई मीटिंग) आयोजित की जा रही है, ताकि शामिल गतिविधियों को बेहतर ढंग से समझा जा सके और यदि कोई संदेह हो तो उसे स्पष्ट किया जा सके। इच्छुक आपूर्तिकर्ताओं से अनुरोध है कि वे नीचे दिए गए तिथि, समय और स्थान पर आयोजित होने वाली प्रारंभिक बैठक में भाग लें।

A Pre-Eoi meeting is arranged by U.R. Rao Satellite Centre, Bengaluru in order to have a better understanding of the activities involved, clarify doubts if any. The interested Vendor[s] are hereby requested to take part in the Pre-Eoi meeting on the Date, Time and Venue mentioned here below:

"ईओआई बैठक पूर्व तारीख" : 22 जुलाई, 2026 (बुधवार)

Date of Pre-Eol Meeting : 22 July 2026(Wednesday)

समय और स्थान : 10:00 से 17:00 बजे तक (भारतीय मानक समय)  
एसआईजी सम्मेलन हॉल  
यू.आर. राव उपग्रह केंद्र  
एचएएल एयरपोर्ट रोड,  
विमानपुरा पोस्ट,  
बेंगलुरु – 560 017

Time & Venue : 10:00 to 17:00 Hours IST  
SIG Conference Hall  
U.R. Rao Satellite Centre,  
HAL Airport Road,  
Vimanapura Post,  
Bengaluru – 560 017.

क्रय एवं भंडार अधिकारी,  
यू. आर. राव उपग्रह केंद्र  
एच.ए.एल. एयरपोर्ट रोड  
बेंगलुरु –560 017 ,  
कर्नाटक, भारत।  
ईमेल: [psog@urssc.gov.in](mailto:psog@urssc.gov.in)  
फोन: 080-25084021"

Focal Point for Pre-Eol Meeting : **Purchase & Stores Officer**  
U R Rao Satellite Centre,  
HAL Airport Road  
Bangalore – 560017, Karnataka, India  
Email: [psog@urssc.gov.in](mailto:psog@urssc.gov.in)  
Phone: 080-25084021

कृपया आपूर्तिकर्ताओं से अनुरोध है कि वे पूर्व ईओआई बैठक में भाग लेने वाले प्रतिनिधियों की जानकारी तालिका-1 में उल्लिखित तिथियों से पहले, यूआरएससी क्रय प्रभाग को अग्रिम रूप से प्रदान करें, ताकि सुरक्षा मंजूरी की व्यवस्था की जा सके। आपूर्तिकर्ता के प्रतिनिधि को 'अधिकार पत्र' साथ रखना होगा ताकि वह पूर्व ईओआई बैठक में भाग ले सकें। प्रत्येक बोलीदाता/कंपनी/संगठन से अधिकतम दो (2) प्रतिनिधि ही बैठक में भाग ले सकेंगे।

Vendor[s] may please provide the details of the representative[s] participating in Pre-Eol meeting well in advance prior to dates specified in Table-1 to URSC, Purchase in order to arrange for Security clearance. Vendor[s] representative shall carry an "Authorization Letter" for attending the Pre-Eol meeting. Member Representatives shall be limited to maximum of two (2) per bidder/ company/organisation.

कृपया ध्यान दें: विक्रेताओं को आगे टेंडरिंग प्रक्रिया में शामिल करने के लिए EoI में भाग लेना अनिवार्य है।

**Note: Participation in EoI is mandatory to consider the vendor[s] further in tendering phase.**

कृपया ध्यान दें कि किसी भी तारीख को आगे बढ़ाने या स्थगित करने के अनुरोधों को किसी भी परिस्थिति में स्वीकार नहीं किया जाएगा।

Please note that request for advancement/postponement of any dates will not be entertained under any circumstances.

जिन विक्रेताओं ने रुचि दिखाई है और जो इसमें भाग ले रहे हैं, उन्हें स्वयं उपस्थित रहना होगा। यूआरएससी/इसरो द्वारा किसी भी प्रकार की परिवहन या आवास की व्यवस्था नहीं की जाएगी।

The Interested Vendor[s] who are participating are required to be present on their own. No transportation/accommodation will be arranged by URSC/ISRO.

**Table-1**

| <b>Important Dates &amp; Timings</b>                                                                                                                                                       |                                |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|
| पूर्व ईओआई बैठक के लिए स्पष्टीकरण/प्रश्नों और भागीदारी विवरणों के जमा करने की अंतिम तिथि।<br>Last date of submission of clarification/ queries & participation details for Pre EOI-Meeting | 22 July 2026; 16:00 Hrs. IST   |
| पूर्व-ईओआई बैठक<br>Pre-EOI meeting                                                                                                                                                         | 23 July 2026; 10:00 Hrs. IST   |
| ईओआई के जवाब जमा करने की अंतिम तिथि।<br>Last date for submission of response to EoI                                                                                                        | 20 August 2026; 16:00 Hrs. IST |
| ईओआई (EoI) खुलने की तिथि।<br>Opening date of EoI                                                                                                                                           | 24 August 2026; 10:00 Hrs. IST |

ईओआई (EOI) के जवाब को पूरी तरह से तैयार करें, जिसमें संदर्भ संख्या और ईओआई की अंतिम तिथि स्पष्ट रूप से लिखी हुई हो। यह जवाब, नीचे दिए गए पते पर यूआरएससी (URSC) में, ऊपर बताए गए तिथि और समय से पहले ही प्राप्त होना चाहिए।

Complete response to EOI, clearly super scribing the reference Number and due date of EOI, must be received at URSC to the address given below, not later than the date and time specified above.

"वरिष्ठ प्रमुख, खरीद और भंडार विभाग,  
यू. आर. राव उपग्रह केंद्र,  
एच.ए.एल. एयरपोर्ट रोड  
बेंगलुरु – 560017, भारत।  
Sr. Head, Purchase & Stores  
U R Rao Satellite Centre,  
HAL Airport Road  
Bangalore – 560017, India

यूआरएससी के पास किसी भी "इच्छा की अभिव्यक्ति" को स्वीकार करने या अस्वीकार करने का अधिकार है, और इसके लिए किसी भी प्रकार का कारण देने की आवश्यकता नहीं होगी।

URSC reserves the right to accept or reject all or any such "Expression of Interest" without assigning any reasons what so ever.

अस्वीकरण: इस निमंत्रण के अंग्रेजी और हिंदी संस्करणों के बीच किसी भी भिन्नता या विसंगति की स्थिति में, अंग्रेजी संस्करण को हमेशा प्राथमिकता दी जाएगी।

Disclaimer: The English version shall always prevail in case any discrepancy or inconsistency between English and Hindi version of this Invitation.

Sd/-

**वरिष्ठ प्रधान, क्रय व भंडार/  
Sr. Head, Purchase & Stores**

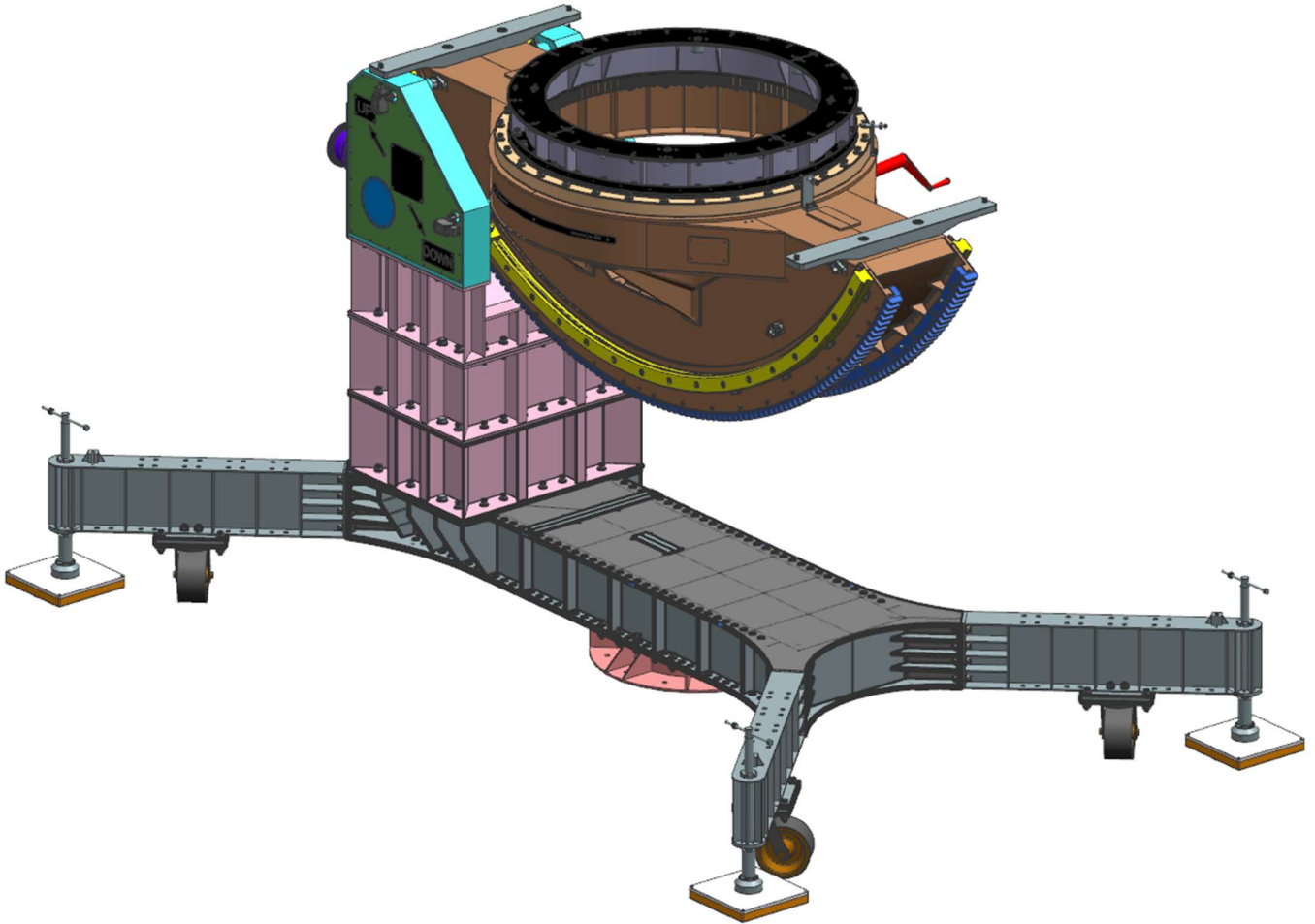
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## **Expression of Interest [Eol]**

**(SPACECRAFT POSITIONER    MODEL-I3K**



## U R RAO SATELLITE CENTRE SPACECRAFT POSITIONER MODEL – I3K



U R RAO SATELLITE CENTRE | BANGALORE - 17

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## ANNEXURES

|                                                   |                                                    |
|---------------------------------------------------|----------------------------------------------------|
| ANNEXURE – E                                      | ELECTRICAL CONTROL PANEL                           |
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| ANNEXURE – II                                     | HELICAL WORM GEAR MOTOR – 1 SPECIFICATIONS         |
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| ANNEXURE – IV                                     | SLEWING RING BEARING AND PINION SET SPECIFICATIONS |
| ANNEXURE – V                                      | BULL GEAR AND PINION SET SPECIFICATIONS            |
| ANNEXURE – VI                                     | AIR PAD & ACCESSORIES SPECIFICATIONS               |
| ANNEXURE – VII                                    | STANDARD ACCESSORIES                               |
| ANNEXURE – VIII                                   | THK MOUNTING INSTRUCTIONS                          |
| <b>ASSEMBLY INSPECTION AND LOAD TEST DRAWINGS</b> |                                                    |
| ASSEMBLY INSPECTION                               | DIMENSIONAL & GEOMETRIC INSPECTION                 |
| STATIC LOAD TEST                                  | SPACECRAFT POSITIONER – 0 <sup>0</sup> POSITION    |
| STATIC LOAD TEST                                  | SPACECRAFT POSITIONER – 90 <sup>0</sup> POSITION   |
| PERFORMANCE LOAD TEST                             | TILT AXIS                                          |
| PERFORMANCE LOAD TEST                             | SPIN AXIS                                          |

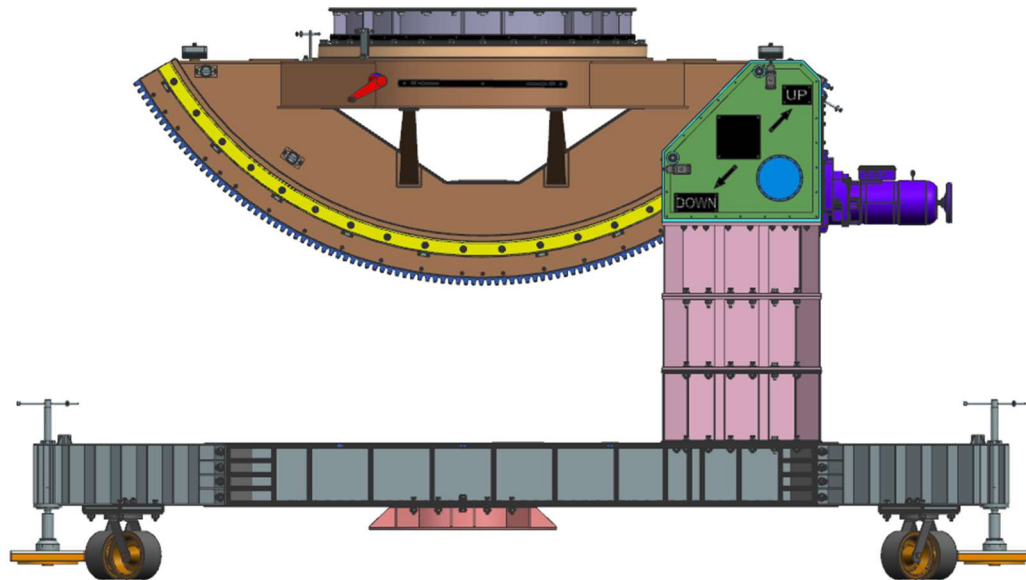
## 1 INTRODUCTION

The **Spacecraft Positioner Model – I3K** (also called ‘**Spacecraft Positioner Model I3K**’) is designed to position Spacecrafts at required orientations for the measurement of its Mass properties (viz., Mass, Center of Gravity and Moment of Inertia). It also enables positioning of the Spacecrafts along arbitrary orthogonal set of axes for the measurement of moments of inertia to compute products of inertia.

## 2 DESCRIPTION OF SPACECRAFT POSITIONER MODEL – I3K

The figure below shows the overall view of the Spacecraft Positioner Model - I3K (Drawing no: ISAC-DTDF-DTDP-12-00408/000). The main features of the Spacecraft Positioner include:

- Spacecraft can be tilted to any angle ( $0^0$  to  $90^0$ ) about an axis parallel to Y-Axis passing through Centre of curvature of bull gear segment.
- Spacecraft can be rotated continuous ( $0^0$  to  $360^0$ ) about an axis parallel to Z-Axis passing through the Centre of Spacecraft mounting adaptor.
- L x B x H (in mm): 4162 x 2584x 2325.
- Approximate weight: 2400 Kg.

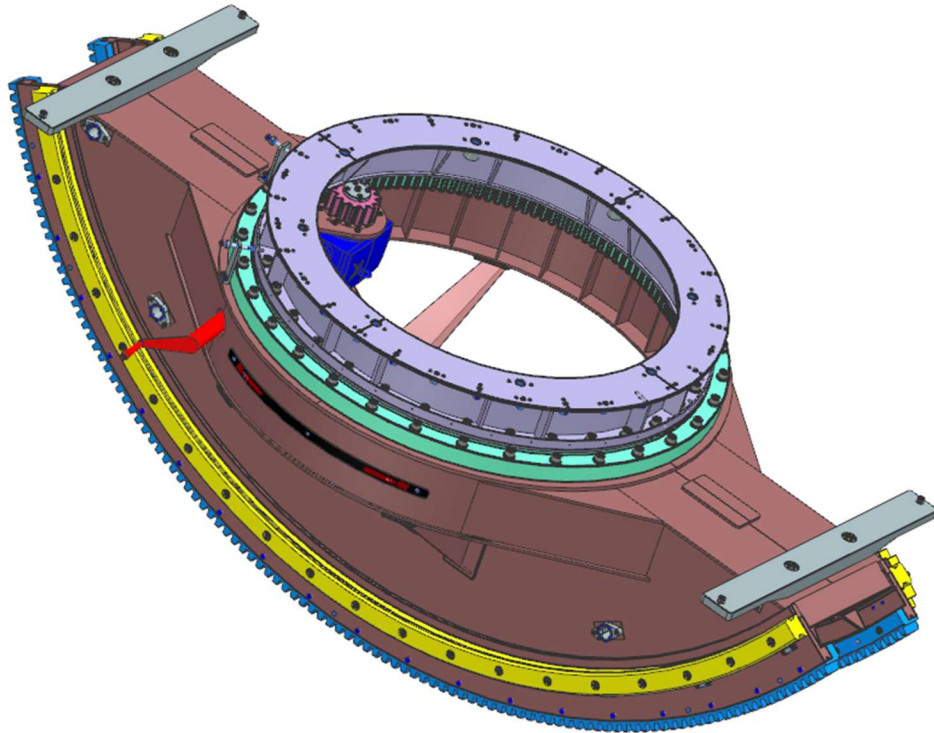


The Spacecraft positioner consists of following 3 major sub-assemblies as follows:

### 2.1 Moving frame assembly (Drawing no: ISAC-DTDF-DTDP-12-00425/000)

The moving frame is a mild steel (ST-42) welded construction having machined mounting interfaces with the following:

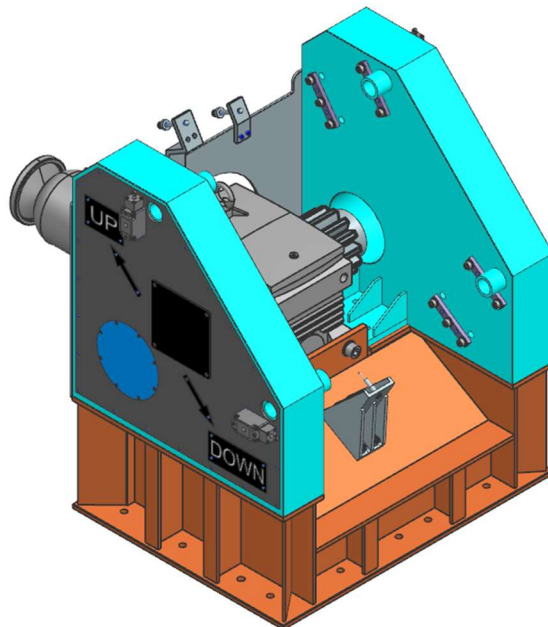
- Spin Axis Drive Assembly consisting of mounting adaptor with angle measuring scale assembly, slewing ring bearing and drive motor with pinion.
- Scale assembly for angular position measurement.
- 2 parallel sets of THK radial rail guide segments
- 2 large bull gear segments.



## 2.2 Drive base assembly (Drawing no: ISAC-DTDF-DTDP-12-00423-000)

The drive base and bearing support brackets are mild steel (ST-42) welded construction having machined mounting interfaces with the following:

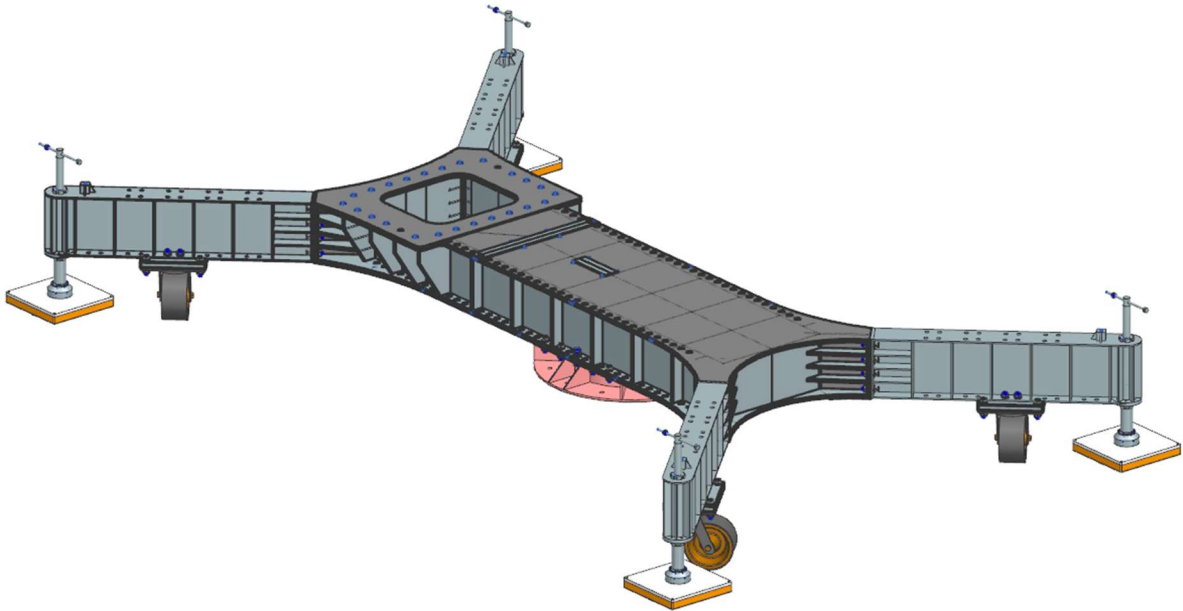
- Drive motor – 1 with Two drive pinions
- 2 LM Bearing support brackets



### 2.3 Base frame assembly (Drawing no: ISAC-DTDF-DTDP-12-00421-000)

Mild steel (ST-42) welded construction consisting of:

- Base frame
- Blue adaptor
- Base lug
- Air pad assembly



## 3 SCOPE OF WORK

The scope of work includes the following:

- 3.1 Assembly, Integration, Inspection, Testing, Qualification and finishing of assemblies as per the contents of this document, fabrication drawings and standard part list enclosed.

**TABLE – I**

| Sl.No | Assembly                                | Quantity<br>(Nos.) | Remarks                                                                                                                                           |
|-------|-----------------------------------------|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| 1     | SPACECRAFT<br>POSITIONER<br>Model – I3K | <b>02</b>          | <ul style="list-style-type: none"><li>• Please refer Table – II for the list of items to be procured by vendor. (Quantity per assembly)</li></ul> |

|                                                                                                                                                                                                                                                                                                                                                                         |  |  |                                                                                                                                                        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                         |  |  | <ul style="list-style-type: none"> <li>• ‘Part List’ and ‘List of Drawings’ enclosed gives the details on Quantity (Quantity per assembly).</li> </ul> |
| <ul style="list-style-type: none"> <li>• Standard Parts/ items listed in this document and PART LIST indicates the quantity corresponding to 01 no. of Spacecraft Positioner Model – I3K only.</li> <li>• All the standard parts/ items listed in the document and PART LIST to be considered for 02 nos. of Spacecraft Positioner Model – I3K while quoting</li> </ul> |  |  |                                                                                                                                                        |

3.2 Delivery at URSC (ISAC) / ISITE, Bangalore.

#### 4 PROCESS PLANNING

The party shall submit process planning for the major activities, such as structural fabrications, large machining, surface treatment and finishing of large surface, integration of sub-assemblies, testing etc

The planning description shall include the following:

- TIME SCHEDULE for all such major activities preferably along with detailed milestone dates of such activities from the date of receipt of our purchase order

## **5 FABRICATION & MACHINING**

### **5.1 FABRICATION**

- 5.1.1 The fabrication of the given assemblies should be as per the drawings supplied (if required 3D model drawings will be supplied). In case of inability to attain any of the said specifications, the same may be highlighted in quotation.
- 5.1.2 The fabricator may prepare requisite sketches, drawings as deemed necessary to communicate to their workforce, technicians & engineers. These detailing that may include cutting plan, weld preparation, fixing detail to machines associated jigs and fixtures are responsibilities of the vendor.
- 5.1.3 Inspection of raw material by NDT methods & certificate of conformance (confirming to IS 2062-2011 standards) by the Vendor is required prior to fabrication process. Relevant documents to be submitted to URSC.
- 5.1.4 Necessary welding fixture and standard fabrication techniques (as per ISO standards) are to be adopted with suitable machining allowance to meet the final size (after machining) as per the drawings.
- 5.1.5 Vendor has to take weld size as per the ISO standards (or minimum thickness of the plate) with continuous weld joints. Proper edge preparation is to be done according to weldment sizes. All the structural parts will be inspected in tag welded condition for appropriate edge preparation by ISRO engineer. After obtaining the clearance from ISRO engineer, full welding should be started.
- 5.1.6 All the welded joints are to be free from defects such as cracks, discontinuity, porosity etc., Adopt established standards to ensure proper welding by taking necessary precautions. Adopt necessary NDT at all levels of fabrication. Dye Penetrant Test (DPT) to be done to inspect the weld quality by the Vendor before proceeding to further operations and X-ray tested whenever suspected for weld, cracks, flow of any kind during inspection and testing.
- 5.1.7 Adopt necessary fixtures for the structure, large machined parts in order to protect them from deformation, distortion or damage of any kind which may occur during fabrication process, machining, handling, etc.
- 5.1.8 All welded structures are to be stress relieved before machining using non-heating process such as resonate frequency method. Relevant documents to be submitted.
- 5.1.9 Utmost care should be taken to protect the machined surfaces. All the parts are to be protected from scratches, tool marks, dents etc.

5.1.10 Continuous plate / single plate without any weld or joint should be used at cross-sections shown in the drawings supplied.

## 5.2 MACHINING

Location tolerances and surface finish to be maintained as per design drawings.

5.2.1 Care should be taken to protect the machined surfaces free from scratches, indent etc.,

5.2.2 All machined surfaces are to be protected from thin film of wax/oil/grease.

5.2.3 Dimensional tolerance to be controlled during machining based on electroplating thickness to get the exact sizes specified in the drawing after machining and electroplating.

5.2.4 Machining on welds should be avoided.

## 6 SYSTEM ASSEMBLY

Following points are to be observed during assembly.

6.1 Care should be taken while assembly of the fixture to ensure geometric tolerances as given in drawing for proper functioning of the system.

6.2 All fasteners are to be high tensile steel (HTS - 10.9) with minimum Ultimate tensile strength of 100 kg/mm<sup>2</sup>. 'UNBRAKO/TVS' make. (Grade – 10.9 or above)

6.3 Proper assembly sequence should be adopted to meet the functional requirement of the fixture.

6.4 **While assembly of ALL standard parts (Linear Motion R-Guides & rails, Large Bull Gear Segment and Pinion, slewing ring bearing & pinion, Helical-Worm geared motors, and Air pads), the Vendor must follow standard procedures/guidelines and adopt all the instructions/methods/steps given in the product catalog by the respective manufacturers, to achieve the required dimensional accuracies and functionality.**

6.5 All sharp edges and corners should be rounded off before sandblasting.

- 6.6 All fastenings are to be self-locking type. Adopt methods such as use of spring washer or nylon or castle nut or lock wire etc. All fasteners in the different assembly should be tightened properly by help of a torque wrench to a definite torque value as recommended by the different manufacturer after consulting with URSC engineer.
- 6.7 All the fasteners are to be blackened with copper base.
- 6.8 A detailed dimensional inspection report should be provided for all the parts, individual assemblies and Complete Fixture Assembly for indenter review before proceeding for load test.

## 6.9 ASSEMBLY OF CRITICAL COMPONENTS/ASSEMBLIES

Each of the following assemblies is critical and utmost care has to be taken to achieve the final intended functionality/ performance of the total system. Hence, manufacturer's standards & necessary ISO standard procedures should be adopted during structural fabrication for assembly of following critical components.

### 6.9.1 THK LM (Linear Motion) R-guides and LM Blocks assembly:

Note that the Parallelism & Positional tolerances of all the LM R-guides assembly are within the limits specified by the manufacturer for proper functioning of the system.

Please refer ANNEXURE – VIII for assembly procedure and mounting instructions.

### 6.9.2 Spin Axis Drive Assembly (Slewing ring bearing & Pinion assembly):

The Centre distance, backlash between the Slewing ring gear & Pinion and Tooth alignment/ Tooth Contact are very important for uniform loading of Slewing ring gear, pinion and Drive motor to achieve the required functionality.

During pinion and slewing ring gear assembly the following should be confirmed:

- Centre distance, tooth clearance or backlash to be achieved as per the manufacturer's standards.
- Blue matching test should be done for uniform loading of the pinion and gear teeth.
- The Vendor should maintain the Dimensional tolerances, Positional tolerances, Mounting/Machined surface requirements (Flatness, Parallelism, Perpendicularity, Machining tolerances) for Drive motor assembly as per manufacturer's standards.

### 6.9.3 Drive Base Assembly (Bull Gear segment (120<sup>0</sup>) & Pinion Assembly)

The Centre distance, backlash between the Bull gear segment & Pinion and Tooth alignment/ Tooth Contact are very important for uniform loading of bull gear, pinion and Drive motor to achieve the required functionality.

During pinion and bull gear assembly the following should be confirmed:

- Centre distance, tooth clearance or backlash to be achieved as per the manufacturer's standards.
- Blue matching should be done for uniform loading of the pinion and gear teeth.
- The Vendor should maintain the Dimensional tolerances, Positional tolerances, Mounting/Machined surface requirements (Flatness, Parallelism, Perpendicularity, Machining tolerances) between the Two Bull Gears for uniform loading of the Two Drive Pinions assembled to the Drive Motor.

#### 6.9.4 Complete system assembly:

The complete assembly should meet the dimensional and positional requirements such as concentricity, perpendicularity, parallelarity, planarity, flatness etc., as indicated in Drg. No: **ISAC-DTDF-DTDP-12-00005/C00**. The measurements to be repeated with number of trails to evaluate mean/RSS value and deviations are to be recorded. Relevant documents to be submitted.

### 7 **ELECTRICAL CONTROL PANEL:**

The control panel for Spacecraft Positioner has to be supplied by the Vendor as per the details given in **ANNEXURE – I**.

### 8 **ACCEPTANCE PROCEDURE**

#### 8.1 **INSPECTION**

The fabricated parts should be inspected as per drawings for geometric and dimensional deviations and confirming within specified tolerance limits.

Vendor should submit inspection report giving the measured dimensions and geometrical dimensions for the parts as well as the assembly and it is to be audited and cleared by ISRO engineers before proceeding for load test.

All the standard parts given in **TABLE-II** are to be inspected and report is to be submitted to URSC engineers before assembling parts to the fixture. Following check should be done by the Vendor.

- i. Compliance verification with respective to drawings, specification given in this document.
- ii. Dimensional and Technical data inspection with respect to drawing and specifications
- iii. Test certificate, warranty certificate, OEM (Original Equipment Manufacturer) certificate, dimensional drawings etc., should be submitted to URSC during delivery.

***Note: Testing & Inspection to be done as per ISO standard procedures. Necessary tooling required for testing & inspection should be arranged by the Vendor.***

### **8.1.1 SPECIFICATION**

1. Capacity:

1.1 Max. Mass of S/C : 2200 Kg

1.2 Max. C.G. height of S/C : 2.0 meter from S/C adaptor mounting plane

2. Max. Allowed S/C envelop:

| Sl.No | Configuration        | Envelop (mm)                                            | Clearance            |
|-------|----------------------|---------------------------------------------------------|----------------------|
| 2.1   | No Spacer            | ø 3800 mm                                               | 90 mm (radial)       |
| 2.2   | 300mm spacer         | ø 4400 mm                                               | 90 mm (radial)       |
| 2.3   | LAM<br>Accommodation | 600 mm (projection below S/C<br>adaptor mounting plane) | 100 mm<br>(vertical) |

3. Mounting interfaces:

| Sl.No | Description                                |
|-------|--------------------------------------------|
| 3.1   | 32 - Holes with M12 Plate nuts on PCD 1200 |
| 3.2   | 8- Holes with M24 Plate nuts on PCD 1060   |

4. Degrees of freedom:

| Sl.No. | Axis of rotation | Speed of Drive motors                                                |
|--------|------------------|----------------------------------------------------------------------|
| 4.1    | Spin Axis        | Approx. 3.0 minutes for 0 <sup>0</sup> to 360 <sup>0</sup> rotation. |
| 4.2    | Tilt Axis        | Approx. 5.0 minutes for 0 <sup>0</sup> to 90 <sup>0</sup> rotation.  |

5. Overall dimensions of S/C positioner (L x B x H): Approx. 4.16m x 2.58m x 2.32m

### **8.1.2 MANDATORY INSPECTION PARAMETERS AND DETAILS:**

The following parameters are to be inspected in presence of URSC engineers

8.1.2.1 Flatness of Spacecraft interface adaptor as specified in drawing.

8.1.2.2 Pitch circle diameters (PCDs) of all the interface mounting holes and positional tolerances of holes positions on PCDs.

- 8.1.2.3 Circularity and concentricity of all circular/curved machined surfaces and PCDs as specified in drawings - moving frame, Spacecraft interface adaptor & interface adaptor.
- 8.1.2.4 Positional tolerances of ALL the locating holes ( $\varnothing 12H7$ ,  $\varnothing 18H7$ ,  $\varnothing 20H7$  etc) on moving frame, base frame, spacers, drive base, LH & RH bearing supports and interface adaptor.
- 8.1.2.5 All locating holes dimension inspection ( $\varnothing 12H7$ ,  $\varnothing 18H7$ ,  $\varnothing 20H7$  etc).
- 8.1.2.6 Go – NoGo for all the threads.
- 8.1.2.7 Assembly inspection for flatness, perpendicularity, parallelarity, positional tolerance & concentricity as specified in Drg. No. ISAC-DTDF-DTDP-12-00005/C00.
- 8.1.2.8 Interface adaptor (Drg. No. ISAC-DTDF-DTDP-12-00017/000) mounting holes matching with Physical Parameters machine at ISITE, Marathahalli, Bangalore.
- 8.1.2.9 Concentricity, parallelarity, flatness and positional tolerances of THK rails in assembled condition to the moving frame.
- 8.1.2.10 Gear segment ( $120^0$ ) & pinion centre distance measurement and blue matching of teeth.
- 8.1.2.11 Slewing ring bearing and pinion centre distance measurement and blue matching of teeth.
- 8.1.2.12 Tolerance on weight of Spacecraft positioner (without one Spacer) = Estimated mass (Kg) + 5% welding + 50 Kg. (Max. weight including all should not exceed: 2500Kg)**

Note:

1. Vendor has to use Optical measurement techniques for assembly inspection and for measuring all tolerances within specified limits (positional, concentricity, circularity, perpendicularity, parallelarity etc.). Relevant certificates to be submitted to URSC.
2. Any deviations in above should be corrected by vendor in concurrence with URSC engineers.

## **8.2 TESTING, EVALUATION AND CERTIFICATION**

### **8.2.1 MASS MEASUREMENT**

The mass of the individual parts and assembly fixture are to be measured and recorded before assembly of the fixture. Vendor has to engrave/punch the measured mass (mark the engraved number in red color) on all individual parts.

A report to be submitted to URSC consisting of measured mass of all individual parts and the total mass of the assembled fixture.

### 8.2.2 LOAD TEST

All the welded joints are to be Dye Penetrant Tested (DPT) and cleared before start of the load tests and again after the load tests.

Apart from the dimensional inspection and conventional checks on Spacecraft Positioner, the following qualification tests are to be executed by the Vendor in the given sequence.

- 1) Static load test
- 2) Performance load test
- 3) Handling and Mobility Tests

The above tests are to be carried out in presence of URSC Quality Control (QC) Engineers. In each of these tests, careful observation is made such that there should not be any flaws in fabrication and all the parts are free from any kind of defects.

Following paragraphs give a brief description of test procedure, equipment/facilities required.

**Note:** The following factors of safety should be taken into account:

- a) For Static load test:

Mass of Spacecraft = 2200 kg

Factor of Safety = 2.0

Simulation mass or Test load, '**SM-1**' =  $2.0 \times 2200 \approx 4400 \text{ kg}$

(Incremental mass in Steps of 500 kg)

Approximate C.G location from mounting plane  $\approx 2.0\text{m}$

- b) For performance load test:

Mass of Spacecraft = 2000 kg

Factor of Safety=1.25

Simulation mass or Test load, '**SM-2**' =  $1.25 \times 2200 \approx 2750 \text{ kg}$

Approximate C.G location from mounting plane  $\approx 2.0\text{m}$

- c) A 3D-model of the simulation test mass and testing plan has to be made by the vendor for above test set ups and to be sent to URSC engineers for approval.

### 8.2.2.1 STATIC LOAD TEST

The completely assembled Spacecraft positioning fixture is to be tested for workmanship verification under following conditions. This test is done to evaluate the strength and Stiffness of the Spacecraft positioner.

**TEST-A:** The moving frame assembly is set horizontal such that the simulation mass = 'SM-1' kg is mounted vertically in increments of 500 kg on the adaptor as shown in 'Drg. No: **ISAC-DTDF-DTDP-12-00005/C01**'. The static deflection at various locations w.r.t increment load is to be recorded. This arrangement is to be held undisturbed for 4 hours.

**TEST-B:** The moving frame is tilted by  $90^0$  as shown in 'Drg. No: **ISAC-DTDF-DTDP-12-00005/C02**' and increments of load are added in steps of 500 kg. The static deflections, tilt (slope angle) at various locations are recorded from minimum load to a maximum load = 'SM-1' kg **at CG offset/eccentricity = 2.0 meter** from mounting plane of the adaptor.

It may be noted that after completion of each test stated above, Visual checks on all critical parts, welded joints, fasteners etc., will be carried out.

Dye penetration test should be done.

Equipment/facilities required

1. Simulation masses up to load = 'SM – 1' kg at CG offset = 2.0m from MS adaptor mounting plane.
2. Dial gauges 0 to 10 mm with 0.1mm least count-10 Nos.
3. Dye Penetrant test kit
4. Overhead crane capacity 15-20 Ton

### 8.2.2.2 PERFORMANCE LOAD TEST

This test is done to evaluate the performance of the Spacecraft Positioner under the action of Dynamic loads.

A Simulated mass = 'SM-2' kg is to be mounted on the moving frame with its **center of gravity offset = 2.0 meter** from mounting plane of the adaptor. The simulation mass should have provisions to enable its mounting on the adaptor.

Following test procedure is to be carried out.

**TEST-A:** In this test, the entire moving frame is tilted from  $0^0$  to  $90^0$  (Clockwise direction), at the rated speed of the motor drive unit such that the axis of the simulation mass in this condition should be parallel to ground plane. After reaching this position,

once again the moving frame is to be tilted back to the original position in the opposite direction (Counter clockwise) as shown in 'Drg. No: **ISAC-DTDF-DTDP-12-00005/C03**'. This complete cycle ( $0^\circ$  to  $90^\circ$  &  $90^\circ$  to  $0^\circ$ ) should be repeated for minimum of 25 cycles.

**TEST-B:** At elevation angles  $0^\circ$ ,  $30^\circ$ ,  $45^\circ$ ,  $60^\circ$  &  $90^\circ$  in the above test, simulation mass is to be rotated about its own axis from  $0^\circ$  to  $360^\circ$  CW & CCW with the help of the spin axis drive assembly as shown in 'Drg. No: **ISAC-DTDF-DTDP-12-00005/C04**'. This should be repeated for minimum of 10 cycles.

**Equipment/facilities required for Test A and Test B:**

1. Simulation masses up to load = 'SM – 2' Kg at CG offset = 2.0m from MS adaptor mounting plane.
2. Dye Penetrant Test kit.
3. Overhead crane capacity 15-20 Ton

**Dye penetration Test has to be done after completion of above test.**

NOTE: *After the completion of each test stated above, visual checks of all critical parts, welded joints and fasteners should be carried out.*

### **8.2.2.3 HANDLING AND MOBILITY TEST**

For handling test, the empty fixture (Spacecraft Positioner Model I3K) and fixture with the working load (SM-2) to be lifted using handling system & crane with the attachment fitted at designated locations and handling to be demonstrated. This test should be conducted with fixture in both  $0^\circ$  and  $90^\circ$  configurations.

For mobility test, the fixture should have the **load =SM-2 kg at CG offset of 2.0m** from MS adaptor mounting plane and the assembly shall be moved on the **plane level surface suitable to Air pad specifications as per manufacturers' standards** for demonstrating free movement of Air pads. Care shall be taken to prevent any damage to the Air pad and accessories during the test.

Visual observations are made to find no cracks or permanent deformation of the parts/fasteners. All the welded joints are subjected to DPT checks for any weld defects. After load test, all fasteners have to undergo radiography/X-ray test. Leakage of air through hoses, hose joints etc., to be corrected /rectified.

**Equipment/facilities:**

1. Simulation masses up to load = 'SM – 2' Kg at CG offset = 2.0m from MS adaptor mounting plane.

2. Suitable handling systems.
3. Air Compressor
4. Air pads and accessories as per ANNEXURE-VI

**Note:**

1. **It is sole responsibility of Vendor to arrange Equipments/facilities, suitable mounting fixtures, handling systems, crane, Test Mass/ Load, measuring instrument for testing.**
2. The above Testing and Inspection should be carried out by the Vendor in presence of URSC QC Engineers.

### **8.3 FINISHING**

#### **8.3.1 Heat treatment and electro plating:**

- Parts are to be anodized / electroplated as specified in the drawings.
- Pins, shafts, etc., have to be heat treated to get the required hardness and strength.
- **All machined elements like pins, shafts, brackets and other elements not painted shall be nickel / chrome plated.** Proper surface preparation for improved adhesion and luster is to be adopted during machining.
- Grounding and Ni-Cr plating is to be done on top surface of Spacecraft mounting adaptors (Surface having mounting holes on 1060mm and 1200 mm PCD). After Plating surface flatness of 0.2mm should be maintained.
- Anti- corrosion Coating on all machined surfaces.

#### **8.3.2 MRF metal coat painting:**

The surface preparations are to be done as follows.

- **Round off edges, remove burrs, undue built up weldment etc.,**
- Clean the surface, to be free from oil, dirt etc.
- **Sand blasting** to be done on all surfaces before painting. All Machined surfaces, bearings are to be protected during Sand blasting the complete surface.
- **Three coats** of Sea worthy epoxy primer which has Zinc content on all un-machined surfaces. **Sample coupons on aluminum & Steel-ST42 sheets to be taken** during every mixing and preparation of paints. These coupons are to be saline spray tested for acceptance.

- **Thinner compatible to primer** should be applied; **Metal paste**, putty touch up and necessary surface preparations should be done for smooth surfaces without any irregularities.
- Color of paint will be intimated after completion of testing.
- **Two coats** MRF metal paint coat with oven curing shall be applied.

All corners shall be fitted with snubbers made of soft rubber and yellow and black stickers shall be pasted on them.

- Vendor should follow the following color scheme for the painting work

| Sl.No | Component                            | Color                  | Equivalent MRF metal coat No.           |
|-------|--------------------------------------|------------------------|-----------------------------------------|
| 1     | Structural Members                   | White & Oxford Blue    | Superior White – 846, Oxford Blue – 112 |
| 2     | Mobile Parts/ Corner                 | Black & Yellow (Zebra) | Passion Yellow – 325, Black – 600       |
| 3     | Drives, Motor, Gears, Bearings etc., | Orange                 | Dawn Glow - 511                         |

- ***Note: Exact layout of color & pattern will be intimated after completion of testing.***

## 9 SCALE ASSEMBLY AND ANGLE MARKING:

There are two angular positioning scales for accurate positioning of fixture at required angular orientations. These scales are to be mounted after final assembly, testing and finishing of the fixture.

### ➤ Scale-I for tilt axis angle measurement ( $0^0$ and $90^0$ )

- 2 Nos. of Scale-I (Product Code: AHD – 150R/3000) are to be bolted to the Moving Frame (Drg. No.: ISAC-DTDF-DTDP-12-00010/000) for tilt axis angle measurement.
- The two scales are to be calibrated between  $0^0$  and  $90^0$  for every  $5^0$  ( $0^0$ ,  $5^0$ ,  $10^0$ ....  $90^0$ ) angle position with an accuracy of  $0.01^0$  **using optical methods or Portable CMM** and the corresponding readings are to be marked on the two scales using LED pointer and mechanical pointer in presence of URSC engineers.
- The above marking on the two scales ( $0^0$ ,  $5^0$ ,  $10^0$ ....  $90^0$ ) is to be done by tilting the fixture with no load condition and full load condition upto 10 cycles for accurate angle marking.
  - No load condition: The fixture to be tilted with no load.
  - Full load condition: The fixture to be tilted with test mass of 2500Kg @ CG offset of 1.8m from adaptor mounting plane of the fixture.

- During No load and Full load condition of the fixture in 90<sup>0</sup> tilt angle position, the distance of mounting plane of the S/C adaptor w.r.t jig bored reference hole no. '0' on the base frame is to be measured and recorded **using optical methods or Portable CMM**.

➤ Scale-II for Spin axis angle measurement (0<sup>0</sup> and 360<sup>0</sup>)

- 1 No. of Scale-II (Product Code: AHD – 150R/4000) is to be bolted to each of the two adaptors (Drg. Nos.: ISAC-DTDF-DTDP-12-00016/000 & ISAC-DTDF-DTDP-12-00143/000) for Spin axis angle measurement.
- The Scale-II is to be calibrated between 0<sup>0</sup> and 360<sup>0</sup> for every 5<sup>0</sup> (0<sup>0</sup>, 5<sup>0</sup>, 10<sup>0</sup>.... 360<sup>0</sup>) angle position with an accuracy of 0.01<sup>0</sup> **using optical methods or Portable CMM** and the corresponding readings are to be marked on Scale-II using LED pointer and mechanical pointer in presence of URSC engineers. This operation is to be repeated upto 10 cycles for accurate angle marking.

## 10 LIST OF STANDARD COMPONENTS TO BE PROCURED BY VENDOR AND INTEGRATE/ ASSEMBLE TO S/C POSITIONER MODEL I3K

**TABLE – II**  
**(Quantity PER Assembly)**

| Sl.No | COMPONENT                           | Specification  | Remarks                                                                                                                   |
|-------|-------------------------------------|----------------|---------------------------------------------------------------------------------------------------------------------------|
| 1     | Linear Motion R – guides, R1500mm   | ANNEXURE – I   | <b>Qty: 02 Nos.</b><br>(consists of 4 Nos. of 60 <sup>0</sup> Segments)To be assembled to Spacecraft Positioner Model I3K |
| 2     | Helical Worm Gear Motor - 1         | ANNEXURE – II  | -                                                                                                                         |
| 3     | Helical Worm Gear Motor - 2         | ANNEXURE – III | -                                                                                                                         |
| 4     | Slewing Ring Bearing and Pinion set | ANNEXURE – IV  | -                                                                                                                         |
| 5     | Bull Gear and Pinion set            | ANNEXURE – V   |                                                                                                                           |
| 6     | Air pad and accessories             | ANNEXURE – VI  | -                                                                                                                         |
| 7     | Standard Accessories                | ANNEXURE – VII | -                                                                                                                         |

**IMPORTANT NOTE:**

1. THE STANDARD COMPONENTS AS GIVEN IN THIS TABLE ABOVE MUST BE REGULAR PRODUCT OF THE OEM (Original Equipment Manufacturer), REPUTED MAKE WITH ALL THE TECHNICAL DETAILS [CONSISTING OF DETAILED SPECIFICATIONS, LIMITING LOAD/ TORQUE/ MOMENT CAPACITIES OR CURVES, SERVICE LIFE, PRODUCT SELECTION

GUIDELINES, MOUNTING AND OPERATING INSTRUCTIONS) AVAILABLE IN THE PRODUCT CATALOG OF THE OEM ALONG WITH NECESSARY ISO STANDARDS & CERTIFICATIONS]

2. THESE ITEMS SHOULD **NOT** BE CUSTOM BUILT OR FABRICATED BY THE VENDOR.
3. DETAILED TECHNICAL SPECIFICATIONS ARE PROVIDED IN THE ANNEXURES
4. DIMENSIONAL DETAILS: DETAILED DIMENSIONAL DETAILS AND INTERFACES ARE PROVIDED IN THE DRAWINGS ENCLOSED.
5. FOR REFERENCE MAKE AND MODEL NUMBERS ARE PROVIDED FOR ALL STANDARD ITEMS/ COMPONENTS.
6. AS THE STANDARD COMPONENTS LISTED IN TABLE-II ARE HIGHLY CRITICAL, ANY CHANGE IN SPECIFICATIONS WILL LEAD TO THE CHANGE IN DESIGN. HENCE, THE VENDOR SHALL EXERCISE EXTREME CARE WHILE PROCURING THE STANDARD COMPONENTS.

## 11 DELIVERY INSTRUCTIONS

**The maximum permissible delivery period is 18 months from the date for Purchase Order. The delivery period is inclusive of testing and inspection.**

The assembled 'Spacecraft Positioner Model I3K' cleared in all respects by URSC engineers, shall be delivered at URSC stores safely. All the parts/assemblies are to be neatly covered and transportation to avoid damages (such as scratches) on the painted parts.

During delivery a complete product manual in Hard copy (spiral binding) & scanned soft copy (pdf format) to be supplied which contains copy of all the documents as given below:

- 11.1 Color Photographs of the complete assembled fixture after finishing & painting, covering all parts and orientations.
- 11.2 Raw Material inspection report & certificate as per section 5.1.3
- 11.3 Dimensional inspection reports of all parts and assembly as per section 8.1.2.
- 11.4 Load test (static, performance, handling & mobility tests) reports with recorded observations & deflection measurements, results along with color photographs as per section 8.2.2.
- 11.5 Stress relieving (non-heating process) certificates and DPT reports of all the parts along with photographs.
- 11.6 Warranty, Technical, Load certificates etc., of all Bought out items.
- 11.7 A separate operating manual and service manual (consisting of all circuit diagrams) for electrical control panel as given in Annexure – I should be supplied.

## 12 NOTE TO VENDOR

- 12.2 In case of any queries on the contents of this document, drawings and bought out items, the vendor should discuss and clarify them with URSC Engineers before initiating actual fabrication and procurement of standard parts.
- 12.3 The standard components as listed in TABLE-II have to be procured by the Vendor. Warranty, Technical literature & specifications, Load Certificates and dimensional drawings of all the bought out items are to be collected from their respective manufacturers / suppliers and should be supplied to URSC at the time of delivery.
- 12.4 All the standard components to be protected from dust, corrosive environment, should be kept clean and handled with utmost care during final assembly, testing and delivery to URSC.
- 12.5 All QC certificates of assembly check, testing have to be submitted to URSC at the time of delivery.

### **TECHNICAL COMPLIANCE FORM**

| Sl.No                                                                                                                                                   | Description                                                                                           | Compliance/<br>Non Compliance |
|---------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|-------------------------------|
| 1                                                                                                                                                       | Scope of work as per Para 3                                                                           |                               |
| 2                                                                                                                                                       | Process planning as per Para 4                                                                        |                               |
| 3                                                                                                                                                       | Fabrication & Machining as per Para 5                                                                 |                               |
| 4                                                                                                                                                       | System Assembly as per Para 6                                                                         |                               |
| 5                                                                                                                                                       | Electrical control panel as per Para 7                                                                |                               |
| 6                                                                                                                                                       | Acceptance procedure as per Para 8                                                                    |                               |
| 7                                                                                                                                                       | Scale assembly and Angle marking as per Para 9                                                        |                               |
| 8                                                                                                                                                       | List of Standard components to be procured by vendor and integrated to S/C positioner as per Table-II |                               |
| 9                                                                                                                                                       | <b>Important Note</b> for procurement of Standard components given in Table-II                        |                               |
| 10                                                                                                                                                      | Delivery Instructions as per Para 11                                                                  |                               |
| 11                                                                                                                                                      | Note to vendor as per Para 12                                                                         |                               |
| 12                                                                                                                                                      | Annexures – I To VIII and Important Notes                                                             |                               |
| 13                                                                                                                                                      | Assembly Inspection and load test drawings                                                            |                               |
| 14                                                                                                                                                      | Part List                                                                                             |                               |
| 15                                                                                                                                                      | Fabrication Drawings                                                                                  |                               |
| <b><u>Important Note:</u> The bid will be rejected/ terminated in case of the following:</b><br><b>1. Non- Submission of Technical Compliance Form.</b> |                                                                                                       |                               |

- 2. Non-compliance, incomplete and part compliance to any one of the above points (serial nos. 1 to 15) in the Technical compliance form.**
- 3. Non-response to the queries within 2 days regarding technical compliance form.**

Authorized Signatory & Company Seal:

Email:

Phone:

Place & Date:

# **ANNEXURES**

## **ANNEXURE-E**

### **ELECTRICAL CONTROL PANEL** **(Quantity: 01 no. per assembly)**

The electrical control panel is designed with improved safety features, maintainability and interchangeability.

#### **Specifications of control panel:**

1. Input Power supply: 3 Ph, 415V, 50Hz.
2. Motor Power Ratings: Refer ANNEXURES – II & III (Two Motors)
3. Power output for Brakes: As per motor specifications given in ANNEXURES – II & III
4. Power output for control circuit: 220Vac, 50Hz.
5. VFD (Variable Frequency Drive) Specifications: (Qty: 2Nos.)
  - Reputed make only as given in ANNEXURE - C.
  - To be selected as per motor specifications given in ANNEXURES – II & III.
  - Should possess inbuilt protection such as Phase sequence and overload protection.
6. PLC (Programmable Logical Control) based controls.
  - PLC Make: Reputed make as given in ANNEXURE - C.
  - Should meet all the functional requirements.

#### **SCOPE OF WORK**

Refer '**pages: 31 to 34**' which gives schematic details of the electrical circuit diagrams for Control Panel.

The scope of work includes the following:

1. The VFD as per specifications given in ANNEXURE – 'A' is to be integrated in the circuit for all the drives.
2. Input choke should be supplied for the drives.

#### **Specification of LC Filter and Sinusoidal Choke:**

The line commutating chokes are used to smooth the voltage peaks or to bridge the commutating dips in the line current. In addition, the choke reduces the harmonic effects of the inverter of the drive. The system must comply with the standard EN 61000-3-12 for the performance.

- Maximum cable length : less than 200 m
  - Insulating strength : As per VDE 0110 clause III
  - Electromagnetic Compatibility : Class A of EN 55011
  - Approval : UL 219022
3. System integrator has to supply and integrate PLC as per the schematic Control circuit diagram given.
  4. System integrator has to optimize I/Os.

5. Communication between PLC and VFDs must be established.
6. The proposed PLC shall have inbuilt protection for the motor like O/C, start fail, prolonged start, phase fail, SPP (single phase preventer) and Phase sequence.
7. The PLC shall be suitable to operation in inching mode.
8. Suitable EMI filter should be supplied inside the panel for PLC.
9. The VFDs, PLC, control switches & components are to be housed inside a compact tamperproof control panel boxes (**Make: Rittal/ equivalent**) with locking features.
10. Associated control wiring and harness routing, anchoring is to be introduced. **Cable length of 10 meters** has to be provided for wiring **between the two drive motors and control panel**.
11. The **cable length** between the power source supplies to control panel is **12 meters**.
12. Plug for input power supply to control panel should be supplied suitable to the socket available at URSC facility (Cutler Hammer make input socket is available at URSC).
13. An extension power board (with 4 plug points) has to be integrated to the control panel.
14. The VFD is required to be programmed and enabled for SOFT START and SOFT STOP. The control logics working along with limit switches are to be maintained, considering the safe operations of the fixture.
15. Set of functional tests for limit switch operations, operations of control switches are to be executed. A performance test & trail of 25 cycles is to be demonstrated and a test certificate has to be given.
16. The final implemented electrical circuit diagram is to be prepared indicating all the wire/ferrule numbers and is to be delivered along with the fixture.
17. A service/user manual comprising of troubleshooting, programming aspects, details of editable parameters is to be delivered along with unit.
18. **Please note that Suitable Plug and Socket connections to be provided for both the Nord drive motors at the Terminal box at locations specified by URSC engineers.**
19. The electrical control panel/panels should be terminated with appropriate plug/socket connections to easily connect/disconnect motor, limit switches, brake etc.
20. Plug and Sockets should be of Lockable Type.
21. Conventional Panel grounding as per electrical standards to be adopted for all control panels.
22. **A compact wireless Remote/ Pendant also has to be supplied containing all the operating push buttons for the two drives with safety options. The size and layout of operating push buttons to be submitted to URSC engineers for approval.**
23. The complete electrical circuit design, layout of components, and all the functional aspects are to be presented time to time for review by ISRO and to be implemented after obtaining approval.
24. Colored indication lamps/LEDs to be provided wherever necessary for failure diagnosis/analysis.
25. The system integrator shall have completed similar type of jobs for last 5 years and at least 5 jobs of this capacity.
26. A warranty period of 12 months has to be given by the Vendor on all the components and functioning aspects of Control Panel from the Date of Acceptance.

### Description of the elements in Control Circuit

1. Toggle switch: To select the mode of operation i.e., PLC mode (or) Manual mode.
2. PB1: Push button for emergency off.
3. PB2: “OFF” Push button for the control panel.
4. PB3: Push and lock Key switch for power supply to control panel.
5. PB4: “ON” Push button for the control panel.
6. PB5: Push button for Hooter for beep sound to check/indicate power supply.
7. PB6: Push button for “UP” motion (Raise) for Z – axis motor (Drive Motor 1) in Inching mode only.
8. PB7: Push button for “DOWN” motion (Lower) for Z – axis motor (Drive Motor 1) in Inching mode only.
9. PB8: Push button for “FORWARD” – direction motion (Counterclockwise) for Tilting motor (Drive Motor 2) in Inching mode only.
10. PB9: Push button for “REVERSE” – direction motion (Clockwise) for Tilting motor (Drive Motor 2) in Inching mode only.
11. LS1 to LS4, PS1 & PS2: Limit & Proximity switches for Z-axis motor (Drive Motor 1)
  - LS1, LS3 & PS1: For “UP” direction to control/limit Upward motion.
  - LS2, LS4 & PS2: For “DOWN” direction to control/ limit Downward motion.
12. CB1 & CB2: These are the Circuit Breakers.
13. L4, L5 & L6: These are the Lamps for Indication of Power supply in Manual and PLC modes.
14. **All Push buttons** should be of **Illuminated Push Button Type** of reputed make.

### INTERLOCKING:

#### Tilting Motor (Drive Motor 1):

- If “UP” direction motion is “ON”, then “Down” direction motion should be “OFF” and Vice Versa.
- The Interlocking for this logic is shown in the Schematic Control circuit diagram and Brake circuit diagram by control contactors “C1” and “C2”.

#### Spin Motor (Drive Motor 2):

- If “CW” direction motion is “ON”, then “CCW” direction motion should be “OFF” and Vice Versa.
- The Interlocking for this logic is shown in the Schematic Control circuit diagram and Brake circuit diagram by control contactors “C3” and “C4”.

### Description of the elements in Power Circuit

1. C5: It is the Main contactor for Power supply.
2. C6: Control contactor for bypassing power supply to Z-axis Motor (Drive Motor 1).
3. C7: Control contactor for bypassing power supply to Tilting Motor (Drive Motor 2).
4. Reversible switch 1: For UP and DOWN motion operation of the Z- axis motor (Drive Motor 1).
5. Reversible switch 2: For FORWARD and REVERSE motion operation of the Tilting motor (Drive Motor 2).

6. L1, L2 & L3: These are the Lamps for Indication of Power supply in three phases (R, Y, & and B).

## **TROLLEY**

A trolley as shown below with **4 – Muvton/Equivalent non-marking castor wheels suitable to clean room specifications (ESD Floor)** is to be supplied by the vendor which carries Control panel, Operating panel, Angle encoder readout system and cable storage cabins.

The trolley should accommodate and support the Control panel, Operating panel, Angle encoder readout system and Cable Storage Cabins. Accordingly, the size of the trolley should be selected (or) fabricated.

A schematic model of the trolley and schematic layout of the components on the trolley is shown below.

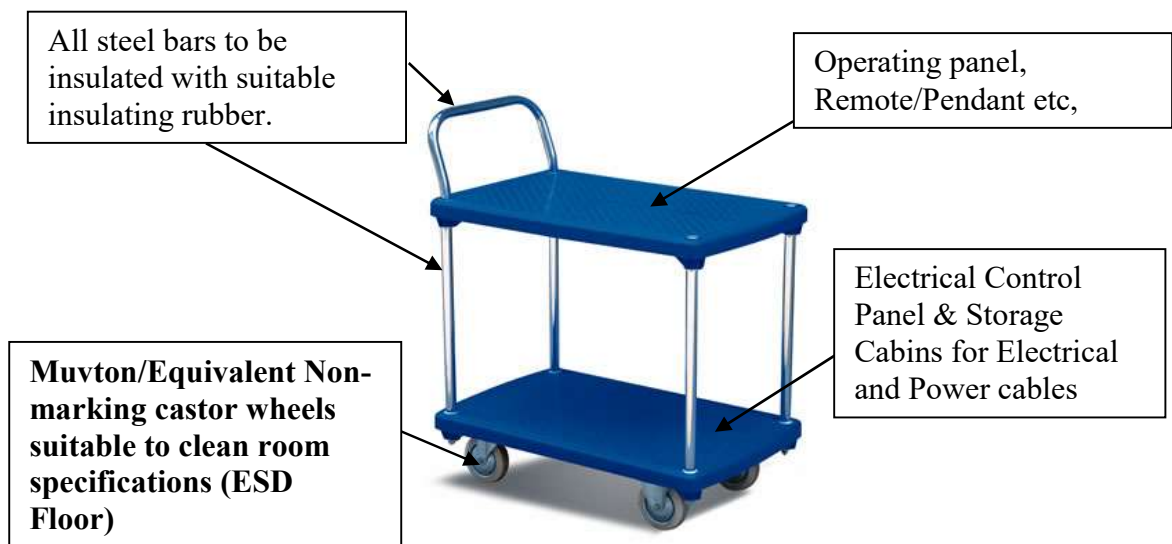


Fig. 1: Schematic model and arrangement of Trolley

### **Note:**

4. The following points should be made clear in the schematic circuit & layout diagrams supplied by the vendor; these points may be clarified from the vendor.
- By pass contactor has to be provided for easy maintenance.
  - Voltage and current indicators are to be provided.
  - On /off control are to be separately provided.
  - Inching operation control is to be provided with separate control.
  - Illuminated push buttons / Indicating lamps are to be provided for indications with proper coloring scheme.
  - The VFD must be protected by fuses.
  - The control circuit must be protected by control fuses.
  - Alarm / Trip indications are to be provided for the VFD and operational failures.

- Circuit diagram, layout of various components is to be given along with quotation. Finalized diagram as implemented on delivered panels are to be given in the service/operational manual.
  - Bill of materials and components indicating quantity and detailed description, brand name, model no. and complete specifications.
  - The vendor may be asked to quote all the necessary spares as optional items in Unit Rate mode.
5. While quoting, the vendor shall assess the complete scope of work such as wiring/harnessing details and other interconnections such as limit switches, brakes etc., in the system.
  3. Integration and commissioning work includes wiring of limit switches, motor wiring, junction box etc and other necessary electrical works on the fixture. The necessary wiring terminations should be done at fixture end and control panel on the trolley with proper plug and socket connections.
  4. The vendor has to submit a circuit/layout diagram for the proposed PLC logics, scheme and Power circuit highlighting all safety and protection system. A complete technical and operating manual containing all details including Bill of materials has to be supplied.
  5. The components are to be sourced from reputed make as indicated in ANNEXURE - C. Any change in make due to non-availability/ any reasons the same may be indicated while quoting. An alternate superior quality may be proposed and the same may be implemented after obtaining approval from URSC engineers.
  6. **All connections** between Control panel, operating panel, two drive motors and Cables to be terminated by using **plug and socket connections**.
  7. All plug and socket connections to be **Non-interchangeable, Lockable type** and reputed make as given in ANNEXURE – C.
  8. The control panel, operating panel, cabins for cables and angle encoder readout system should be rigidly bolted to the Trolley.

#### ANNEXURE – ‘A’

##### Specifications for VFD (Variable Frequency Drive)

(QTY: 02 Nos.)

- |                          |                                              |
|--------------------------|----------------------------------------------|
| 1. Rated motor power     | : 1.5 kW                                     |
| 2. Input voltage         | : 3 AC 380....480 V, -20% /+10%, 47....63 Hz |
| 3. Rated current         | : 5.6 A                                      |
| 4. Output voltage        | : 3 AC Ø – Mains voltage                     |
| 5. Rated output current  | : 4A                                         |
| 6. Output frequency      | : 0 Hz .... 400 Hz                           |
| 7. Phase                 | : 3Ph., 4-Wire                               |
| 8. Enclosure             | : IP 20                                      |
| 9. Ambient temperature   | : 0 °C .... +40 °C                           |
| 10. Dimensions (approx.) | : (L1*B*T in [mm] ) : 225*75*155 mm          |
| 11. Approximate weight   | : 2.0 kg                                     |

12. Encoder specifications: - Four parameter sets, selectable on-line
- Sensor less vector control
  - Automatic motor identification
  - 5 digits inputs, 2 analog outputs
  - 2 relay outputs, 1 analog output
  - Integrated brake chopper and dynamic brake control
  - RS232 and RS485 compatibility via RJ12 connector
13. Leakage Current : <10mA

\*Note:

- The proposed VFD shall have inbuilt protection for phase fail, SPP (single phase preventer) Phase sequence and should cover EMC requirements (as per standards EN 61800-3/A11 (2000) or EN 55011).
- All the VFDs to be supplied with rated motor power = 1.5 KW.
- The VFD should work in both type of connection i.e., STAR or DELTA.

### ANNEXURE - 'C'

#### **List of Approved Makes**

| Sl. No. | Item                                                                        | Approved Brand                                                                                    |
|---------|-----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| 1.      | PVC wires (Copper)<br>(1.1 KV Grade)                                        | <b>Finolex /Rallison /Anchor /Alind / Ravi / Myso cables.</b>                                     |
| 2.      | Sockets, plugs (Lockable Type with poly carbonate, FRP or metal clad body ) | <b>Best &amp; Crompton / ABB / Crompton greaves / Anchor Roma / Lisha / MK / LK / Legrand MDS</b> |
| 3.      | Miniature circuit breakers, (MCBs)                                          | <b>ABB / Siemens / Schneider / Legrand MDS / AREVA T&amp;D/ GE / Indo kopp /L&amp;T</b>           |
| 4.      | HRC fuse base & carriers                                                    | <b>Siemens / indokopp / Schneider / GEPower / L&amp;T / Standard</b>                              |
| 5.      | MV Switch fuse units & isolators up to 250 A for general applications       | <b>Siemens / ABB / Schneider / GEPower / Stanard / Indo Asian / L&amp;T</b>                       |
| 6.      | HRC fuses                                                                   | <b>Siemens / GEPower / Standard / Indo Asian / L&amp;T / Standard / Crompton Greaves/</b>         |
| 7.      | Overload relays with built-in Single phase preventers                       | <b>Siemens / Schneider /L&amp;T / GE Power controls / ABB</b>                                     |

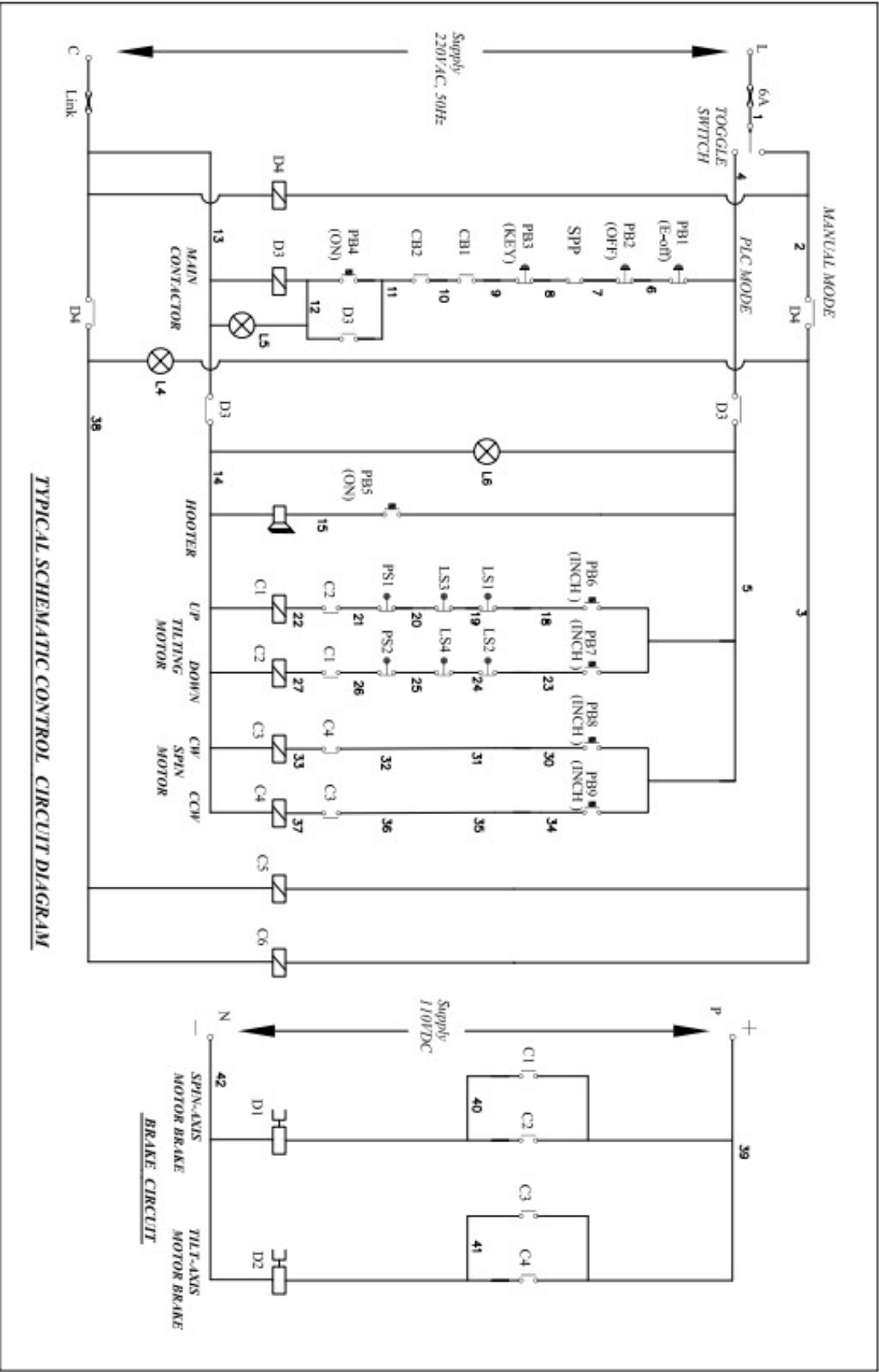
|     |                                                                            |                                                                                                            |
|-----|----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|
| 8.  | Digital type instruments<br>Ammeters, Voltmeter, Frequency meter, PF meter | <b>L&amp;T /GE (Digital)/ AE / MECO /Electro systems/ Konzerv / CG schlumberger</b>                        |
| 9.  | Push button stations & Key actuators                                       | <b>Siemens / Schneider / ABB / C&amp;S / L&amp;T / GE Power controls/ Vishnav / Bharatia cuttlerhammer</b> |
| 10. | Air break power / control contactors.                                      | <b>Siemens / ABB / L&amp;T / GE Power controls</b>                                                         |
| 11. | Rotary Switch                                                              | <b>Siemens / L&amp;T / GE Power controls / Soltzer.</b>                                                    |
| 12. | Timer                                                                      | <b>Siemens / L&amp;T / GE Power controles / ABB/ Bharatia cuttlerhammer / Schneider.</b>                   |
| 13. | Selector Switches/ Toggle Switches/ Push lock key reset                    | <b>L&amp;T / Soltzer</b>                                                                                   |
| 14. | PLCs                                                                       | <b>Siemens, GE, Schneider, ABB, Alsthom.</b>                                                               |
| 15. | <u>Limit Switch</u> : (Metal Casing)                                       | <b>Make: Teknic Euchner, Telemecanique /Equivalent model in Allen-Bradley/ABB/Siemens/SCHEMERSAL.</b>      |
| 16. | Variable Frequency Drive (VFD) :                                           | <b>Siemens, Schneider, ABB, Nord, SEW.</b>                                                                 |

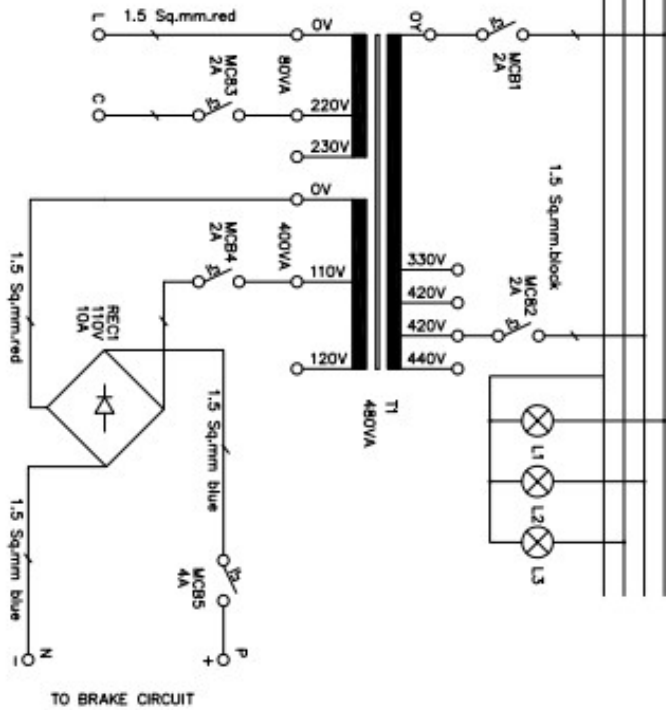
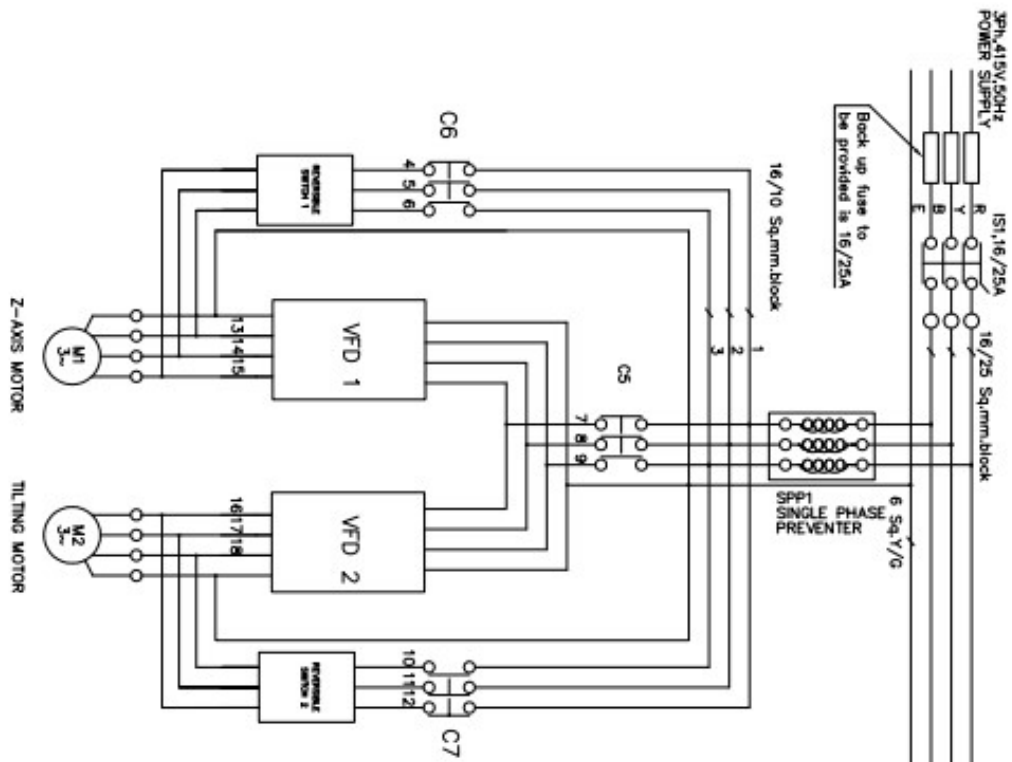
**NOTE:** The list of makes to be used must be adhered. The change in make will not be allowed. Any change in maker of superior quality has to be approved by the department (URSC). All the components to be used should be “CE” marked.

## Electrical Control Panel Drawing

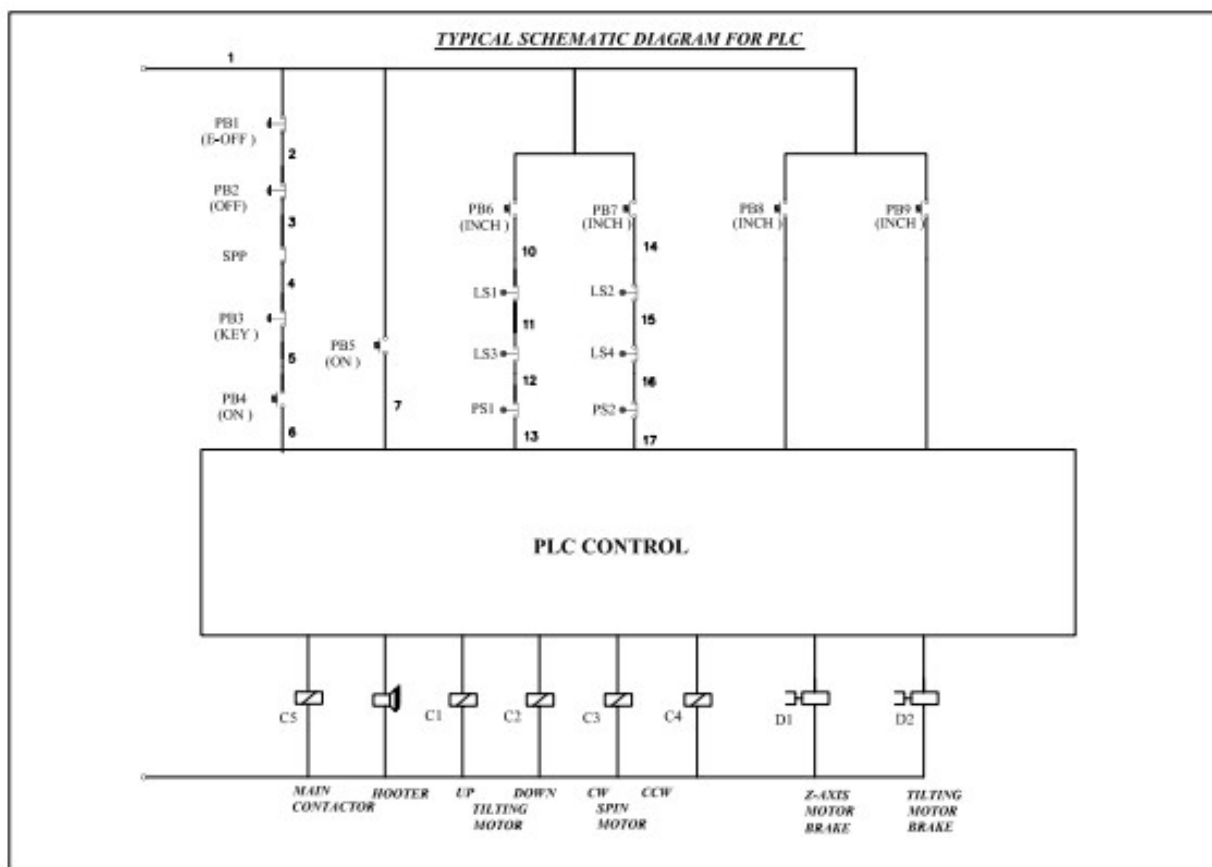








TYPICAL SCHEMATIC POWER CIRCUIT DIAGRAM



|                          |                                       |               |                     |
|--------------------------|---------------------------------------|---------------|---------------------|
| 11                       | Proximity Switch                      | 02            | —                   |
| 10                       | Toggle switch                         | 01            | —                   |
| 9                        | Reversible switch                     | 02            | —                   |
| 8                        | Programmable Logic Control, PLC       | 01            | —                   |
| 7                        | Control/Power Contactors and Contacts | 26            | C1 to C6 & D1 to D4 |
| 6                        | Limit Switch, LS                      | 04            | LS1 to LS6          |
| 5                        | Push Buttons                          | 09            | PB1 to PB9          |
| 4                        | VFD(1.5 KW)                           | 02            | VFD1 & VFD2         |
| 3                        | Lamps                                 | 06            | L1 to L6            |
| 2                        | Miniature Circuit Breakers            | 05            | MCB1 to MCB5        |
| 1                        | Single Phase Preventer                | 02            | SPP1 & SPP          |
| Sl.No                    | Name to the Item                      | Quantity(Nos) | Remarks             |
| <b>BILL OF MATERIALS</b> |                                       |               |                     |

**NOTE:**

1. PLC INTEGRATOR HAS TO SUPPLY AND INTEGRATE PLC BASED ON THE CONTROL CIRCUIT DIAGRAM GIVEN.
2. PLC INTEGRATOR HAS TO OPTIMIZE THE I/Os.
3. THE PARTY HAS TO SUBMIT A DRAFT SCHEMATIC DIAGRAM OF THE PROPOSED PLC DIAGRAM/ SCHEME, POWER CIRCUIT DIAGRAM FOR THE SUBMITTED ELECTRIC SCHEMATIC DIAGRAM TO ISAC ENGINEERS. THE SCHEMATIC SHALL HAVE ALL SAFETY AND PROTECTION SYSTEM. AFTER CLEARANCE FROM THE ISAC, PARTY HAS TO TAKE UP THE JOB.
4. ALL FIGURES SHOWN HERE ARE TYPICAL SCHEMATIC CIRCUIT DIAGRAMS MEETING THE FUNCTIONAL REQUIREMENTS. IN CASE OF ANY QUERIES/CLARIFICATIONS/CORRECTIONS PARTY HAS TO CONTACT ISAC ENGINEERS.

## **ANNEXURE-I**

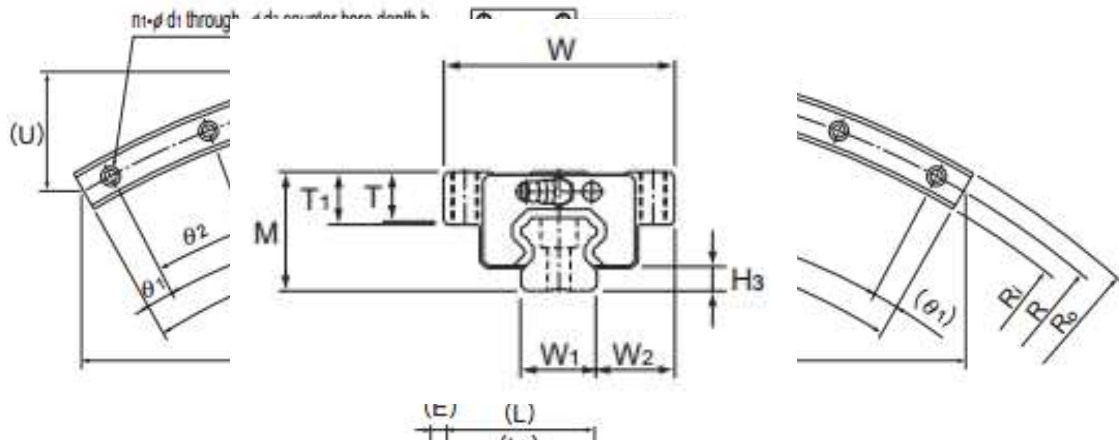
### **LINEAR MOTION R –GUIDES & RAILS**

(Quantity: 04 Segments per assembly, Each Segment consists of [1 rail (60°) + 1 guide])

Make: - THK, JAPAN/ ANY EQUIVALENT MEETING ALL THE SPECIFICATIONS GIVEN BELOW AND DIMENSIONS AS GIVEN IN THE DRAWING.

**Specifications:**

|                                                                                                                           | LINER MOTION R - GUIDES                            |                                                               |
|---------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|---------------------------------------------------------------|
| Sl.No.                                                                                                                    | Description                                        | Specifications                                                |
| 1                                                                                                                         | Radius of Curvature, R                             | 1500mm                                                        |
| 2                                                                                                                         | Dimensions & mounting hole interfaces              | As per the drawing no.:<br><b>ISAC-DTDF-DTDP-12-00023/000</b> |
| 3                                                                                                                         | Detailed specifications are given in below figures |                                                               |
| <b><u>Note:</u></b><br>• Vendor has to submit OEM (Original Equipment Manufacturer), Warranty and Guarantee Certificates. |                                                    |                                                               |



| Outer dimensions |                |                                  |                |     | LM block dimensions |                |                |                                   |                |    |                  |                  |     |     |         |               | H <sub>3</sub> | mm            |         |
|------------------|----------------|----------------------------------|----------------|-----|---------------------|----------------|----------------|-----------------------------------|----------------|----|------------------|------------------|-----|-----|---------|---------------|----------------|---------------|---------|
| Height           | Width          | Length                           |                |     |                     |                |                |                                   |                |    |                  |                  |     |     |         |               |                |               |         |
| M                | W              | L                                | B              | C   | S                   | L <sub>1</sub> | T              | T <sub>1</sub>                    | N              | E  | Grease nipple    |                  |     |     |         |               |                |               |         |
| 90               | 170            | 197.9<br>197.9<br>197.9<br>197.9 | 142            | 106 | M16                 | 147            | 34.9           | 37                                | 19             | 16 | B-PT1/8          |                  |     |     |         |               |                |               |         |
| R                | R <sub>0</sub> | R <sub>1</sub>                   | L <sub>0</sub> | U   | W <sub>1</sub>      | W <sub>2</sub> | M <sub>1</sub> | d <sub>1</sub> ×d <sub>2</sub> ×h | n <sub>1</sub> | θ° | θ <sub>1</sub> ° | θ <sub>2</sub> ° | kN  | kN  | 1 block | Double blocks | 1 block        | Double blocks | 1 block |
| 1500             | 1531.5         | 1468.5                           | 1500           | 201 |                     |                |                |                                   | 10             | 60 | 3                | 6                |     |     |         |               |                |               |         |
| 2000             | 2031.5         | 1968.5                           | 1531           | 152 | 63                  | 53.5           | 53             | 18×26×22                          | 12             | 45 | 0.5              | 4                | 141 | 215 | 2.45    | 13.2          | 2.45           | 13.2          | 3.2     |

Static permissible moment\*: 1 block: static permissible moment value with 1 LM block

Double blocks: static permissible moment value with 2 blocks closely contacting with each other

**IMPORTANT NOTE:**

1. THE STANDARD COMPONENTS AS GIVEN ABOVE MUST BE REGULAR PRODUCT OF THE OEM (Original Equipment Manufacturer), REPUTED MAKE WITH ALL THE TECHNICAL DETAILS [CONSISTING OF DETAILED SPECIFICATIONS, LIMITING LOAD/ TORQUE/ MOMENT CAPACITIES OR CURVES, SERVICE LIFE, PRODUCT SELECTION GUIDELINES, MOUNTING AND OPERATING INSTRUCTIONS) AVAILABLE IN THE PRODUCT CATALOG OF THE OEM ALONG WITH NECESSARY ISO STANDARDS & CERTIFICATIONS]
2. THESE ITEMS SHOULD **NOT** BE CUSTOM BUILT OR FABRICATED BY THE VENDOR.
3. DETAILED DIMENSIONAL DETAILS AND INTERFACES ARE PROVIDED IN THE DRAWINGS ENCLOSED.
4. ANY CHANGE IN SPECIFICATIONS WILL LEAD TO THE CHANGE IN DESIGN. HENCE, THE VENDOR SHALL EXERCISE EXTREME CARE WHILE PROCURING THE STANDARD COMPONENTS.

**ANNEXURE-II**  
**HELICAL WORM GEAR MOTOR – 1**  
**(Quantity: 01 no. per assembly)**

**Important Note:**

**Make: - NORD/ ANY EQUIVALENT MEETING ALL THE SPECIFICATIONS GIVEN BELOW AND DIMENSIONS AS GIVEN IN THE DRAWING.**

**(Nord Model No. for reference: SK 12080 AZ VL - 71 L/4 BRE5 HL RG WE MS Terminal Box at 2)**

|                             |                                                  |
|-----------------------------|--------------------------------------------------|
| 1. Type                     | SK12080AZ VL-71L/4 BRE5 HL RG WE MS              |
| 2. Motor power              | 0.37 kW                                          |
| 3. Output speed             | 1380/2.6 RPM                                     |
| 4. Output torque            | 680 Nm                                           |
| 5. Service factor           | 1.1                                              |
| 6. Reduction                | 520.20                                           |
| 7. Mode of operation        | S1                                               |
| 8. Insulation class         | F                                                |
| 9. Enclosure:               | IP 55                                            |
| 10. Supply                  | 230/400 V, 50 Hz                                 |
| 11. Rated current: (400 V)  | 1.09 A                                           |
| 12. Output shaft            | Diameter = 40H7 mm (hollow shaft)                |
| 13. Mounting position       | H1/M1                                            |
| 14. Terminal box position   | 2 (Refer Drg No.: 'ISAC-DTDF-DTDP-12-00082/000') |
| 15. Cable entry position    | III                                              |
| 16. Approximate weight      | 36 kg without options                            |
| 17. Brake                   | 5 Nm                                             |
| 18. Brake supply            | 400V AC/180V DC                                  |
| 19. Paint coatings          | Paint specification 2                            |
| 20. Top coat                | RAL 5010 blue                                    |
| 21. Gear design             | Shaft mounted (AZ)                               |
| 22. Lubricant               | Synthetic oil, ISO VG 680                        |
| <b>23. Gear Box Options</b> | <b>VL: VL- Reinforced bearing</b>                |

- |                    |                                                                                       |
|--------------------|---------------------------------------------------------------------------------------|
| 24. Motor options  | LL: long term storage<br>WE: WE - extended shaft<br>MS: Motor quick connector HAN 10E |
| 25. Brake options: | HL: HL - Hand release lever<br>RG: RG - Brake corrosion-protected                     |

*Note:*

- 1. Please refer Drg. No.: 'ISAC-DTDF-DTDP-12-00082/000' for dimensions, mounting Position and Terminal Box location.*
- 2. Vendor has to submit OEM (Original Equipment Manufacturer), Drawing, Warranty and Guarantee Certificates.*

**IMPORTANT NOTE:**

1. THE STANDARD COMPONENTS AS GIVEN ABOVE MUST BE REGULAR PRODUCT OF THE OEM (Original Equipment Manufacturer), REPUTED MAKE WITH ALL THE TECHNICAL DETAILS [CONSISTING OF DETAILED SPECIFICATIONS, LIMITING LOAD/ TORQUE/ MOMENT CAPACITIES OR CURVES, SERVICE LIFE, PRODUCT SELECTION GUIDELINES, MOUNTING AND OPERATING INSTRUCTIONS) AVAILABLE IN THE PRODUCT CATALOG OF THE OEM ALONG WITH NECESSARY ISO STANDARDS & CERTIFICATIONS]
2. THESE ITEMS SHOULD **NOT** BE CUSTOM BUILT OR FABRICATED BY THE VENDOR.
3. DETAILED DIMENSIONAL DETAILS AND INTERFACES ARE PROVIDED IN THE DRAWINGS ENCLOSED.
4. ANY CHANGE IN SPECIFICATIONS WILL LEAD TO THE CHANGE IN DESIGN. HENCE, THE VENDOR SHALL EXERCISE EXTREME CARE WHILE PROCURING THE STANDARD COMPONENTS.

**ANNEXURE-III**  
**HELICAL WORM GEAR MOTOR – 2 (Quantity: 01)**

**Important Note:**

**Make: - NORD/ ANY EQUIVALENT MEETING ALL THE SPECIFICATIONS GIVEN BELOW AND DIMENSIONS AS GIVEN IN THE DRAWING.**

**(Nord Model No. for reference: SK 43125LX VL – 80 L/4 BRE20 SR HL HR RG MS**

**Terminal Box at 2)**

|                            |                                                          |
|----------------------------|----------------------------------------------------------|
| 1. Type                    | SK43125LX VL-90S/4 BRE20 SR HL HR RG MS                  |
| 2. Motor power             | 0.75 kW                                                  |
| 3. Output speed            | 1375/1.1 RPM                                             |
| 4. Output torque           | 3321 Nm                                                  |
| 5. Service factor          | 1.0                                                      |
| 6. Reduction               | 1,198.50                                                 |
| 7. Mode of operation       | S1                                                       |
| 8. Insulation class        | F                                                        |
| 9. Enclosure:              | IP 55                                                    |
| 10. Supply                 | 230/400 V, 50 Hz                                         |
| 11. Rated current: (400 V) | 2.1 A                                                    |
| 12. Output shaft           | Diameter = 60 mm. length = 120 mm                        |
| 13. Output shaft side      | A+B                                                      |
| 14. Mounting position      | B3/M1                                                    |
| 15. Terminal box position  | 2 (Refer Drg. No.: 'ISAC-DTDF-IGEN-12-06612/002')        |
| 16. Cable entry position   | III                                                      |
| 17. Approximate weight     | 122 kg without options                                   |
| 18. Brake                  | 20 Nm                                                    |
| 19. Brake supply           | 400V AC/180V DC                                          |
| 20. Paint coatings         | Paint specification 2                                    |
| 21. Top coat               | RAL 5010 blue                                            |
| 22. Gear design            | Solid shaft, output shaft on both sides (LX)             |
| 23. Lubricant              | Synthetic oil, ISO VG 680                                |
| 24. Gear Box Options       | VL: VL-reinforced bearing<br>LL: long-term storage       |
| 25. Motor options          | HR: HR - Hand wheel<br>MS: Motor quick connector HAN 10E |
| 26. Brake options:         | HL: HL - Hand release lever<br>SR: SR - Dust protected   |

*Note:*

- 1. Please refer Drg. No.: 'ISAC-DTDF-IGEN-12-06612/002' for dimensions, mounting position and Terminal Box location. 2 holes, M16 to be drilled as shown in drawing.*
- 2. Vendor has to submit OEM (Original Equipment Manufacturer), Drawing, Warranty and Guarantee Certificates.*

**IMPORTANT NOTE:**

1. THE STANDARD COMPONENTS AS GIVEN ABOVE MUST BE REGULAR PRODUCT OF THE OEM (Original Equipment Manufacturer), REPUTED MAKE WITH ALL THE TECHNICAL DETAILS [CONSISTING OF DETAILED SPECIFICATIONS, LIMITING LOAD/ TORQUE/ MOMENT CAPACITIES OR CURVES, SERVICE LIFE, PRODUCT SELECTION GUIDELINES, MOUNTING AND OPERATING INSTRUCTIONS) AVAILABLE IN THE PRODUCT CATALOG OF THE OEM ALONG WITH NECESSARY ISO STANDARDS & CERTIFICATIONS]
2. THESE ITEMS SHOULD **NOT** BE CUSTOM BUILT OR FABRICATED BY THE VENDOR.
3. DETAILED DIMENSIONAL DETAILS AND INTERFACES ARE PROVIDED IN THE DRAWINGS ENCLOSED.
4. ANY CHANGE IN SPECIFICATIONS WILL LEAD TO THE CHANGE IN DESIGN. HENCE, THE VENDOR SHALL EXERCISE EXTREME CARE WHILE PROCURING THE STANDARD COMPONENTS.

**ANNEXURE – IV**

**SLEWING RING BEARING & PINION SET PER ASSEMBLY**

MAKE: - ROTHE ERDE / ANY EQUIVALENT MEETING ALL THE SPECIFICATIONS GIVEN BELOW AND DIMENSIONS AS GIVEN IN THE DRAWING.

[Rothe Erde Model no. for reference: Roller bearing slewing ring, **MFG. DRG NO.:**

**162.20.1243.000.11.1433**

CORRESPONDING PINION: (MFG. Drg No: 421.08.0614.074 .03.0303)]

| <b>SLEWING RING BEARING SPECIFICATIONS (Qty: 01 No.)<br/>(DRAWING TO BE GIVEN BY OEM)</b>                 |                                   |                                                        |
|-----------------------------------------------------------------------------------------------------------|-----------------------------------|--------------------------------------------------------|
| <b>Sl.No</b>                                                                                              | <b>Description</b>                | <b>Specifications</b>                                  |
| 1                                                                                                         | Module, m                         | 8.0 mm                                                 |
| 2                                                                                                         | No. of teeth, z2                  | -140                                                   |
| 3                                                                                                         | Addendum modification, xm2        | -4.0 mm                                                |
| 4                                                                                                         | Addendum reduction, km2           | 0 mm                                                   |
| 5                                                                                                         | Pitch circle diameter, d2         | 1120.0 mm                                              |
| 6                                                                                                         | Quality DIN 3967, tolerance block | 12 de                                                  |
| 7                                                                                                         | Pressure angle (alpha)            | 20 <sup>0</sup>                                        |
| 8                                                                                                         | Basic rack profile                | DIN 867                                                |
| 9                                                                                                         | Material                          | 46CR4N                                                 |
| 10                                                                                                        | Weight                            | 167 Kg                                                 |
| 11                                                                                                        | Dimensions                        | As per the drawing no.:<br>ISAC-DTDF-DTDP-12-00022/000 |
| <b>CORRESPONDING PINION SPECIFICATIONS (Qty: 01 No.)<br/>(MATCHING PINION DRAWING TO BE GIVEN BY OEM)</b> |                                   |                                                        |
| <b>Sl.No</b>                                                                                              | <b>Description</b>                | <b>Specifications</b>                                  |
| 1                                                                                                         | Tolerance                         | DIN 3962                                               |
| 2                                                                                                         | Module, m                         | 8.0 mm                                                 |
| 3                                                                                                         | No. of teeth, z1                  | 14                                                     |
| 4                                                                                                         | Addendum modification, xm1        | 4.0 mm                                                 |
| 5                                                                                                         | Addendum reduction, km1           | 0 mm                                                   |
| 6                                                                                                         | Pitch circle diameter, d1         | 112.0 mm                                               |
| 7                                                                                                         | Centre distance, a                | 504 mm                                                 |
| 8                                                                                                         | Quality DIN 3967, tolerance block | 6H 25                                                  |
| 9                                                                                                         | Pressure angle (alpha)            | 20 <sup>0</sup>                                        |
| 10                                                                                                        | Helix angle (beta)                | 0 <sup>0</sup>                                         |
| 11                                                                                                        | Basic rack profile                | DIN 867                                                |
| 12                                                                                                        | Material                          | 16MnCr5E                                               |
| 13                                                                                                        | Weight                            | ~5.0 Kg                                                |

|    |            |                                                        |
|----|------------|--------------------------------------------------------|
| 14 | Dimensions | As per the drawing no.:<br>ISAC-DTDF-DTDP-12-00032/000 |
|----|------------|--------------------------------------------------------|

**Note:**

1. *Hole and keyway dimensions in pinion should confirm to the dimensions of Bore diameter and keyway dimensions of Helical Worm Gear Motor – 1 (as supplied from the manufacturer) as given in ANNEXURE – II.*
2. *Vendor has to submit OEM (Original Equipment Manufacturer), Warranty and Guarantee Certificates.*

**IMPORTANT NOTE:**

1. THE STANDARD COMPONENTS AS GIVEN ABOVE MUST BE REGULAR PRODUCT OF THE OEM (Original Equipment Manufacturer), REPUTED MAKE WITH ALL THE TECHNICAL DETAILS [CONSISTING OF DETAILED SPECIFICATIONS, LIMITING LOAD/ TORQUE/ MOMENT CAPACITIES OR CURVES, SERVICE LIFE, PRODUCT SELECTION GUIDELINES, MOUNTING AND OPERATING INSTRUCTIONS) AVAILABLE IN THE PRODUCT CATALOG OF THE OEM ALONG WITH NECESSARY ISO STANDARDS & CERTIFICATIONS]
2. THESE ITEMS SHOULD **NOT** BE CUSTOM BUILT OR FABRICATED BY THE VENDOR.
3. DETAILED DIMENSIONAL DETAILS AND INTERFACES ARE PROVIDED IN THE DRAWINGS ENCLOSED.
4. ANY CHANGE IN SPECIFICATIONS WILL LEAD TO THE CHANGE IN DESIGN. HENCE, THE VENDOR SHALL EXERCISE EXTREME CARE WHILE PROCURING THE STANDARD COMPONENTS.

**ANNEXURE-V**

**BULL GEAR SEGMENT (120<sup>0</sup>) & PINION SET PER ASSEMBLY**

MAKE: - ROTHE ERDE / ANY EQUIVALENT MEETING ALL THE SPECIFICATIONS GIVEN BELOW AND DIMENSIONS AS GIVEN IN THE DRAWING.

[Rothe Erde Model no. for reference: Roller bearing slewing ring, MFG. DRG NO.: 401.10.0699.040 – DRAFT1]

CORRESPONDING PINION: [As per DRG NO.: ISAC-DTDF-DTDP-12-00028/000]

| <b>GEAR RING SEGMENT (120<sup>0</sup>) - (QTY.: 03 Nos.)<br/>(DRAWING TO BE GIVEN BY OEM)</b>                                                                                                                                                                                                                                                                                                                                                                                   |                                   |                                                        |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|--------------------------------------------------------|
| <b>Sl.No</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>Description</b>                | <b>Specifications</b>                                  |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Module, m                         | 10.0 mm                                                |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | No. of teeth, (z2)                | 327 (109)                                              |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Addendum modification, xm2        | 2.5 mm                                                 |
| 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Addendum reduction, km2           | -1.0 mm                                                |
| 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Pitch circle diameter, d2         | 3270 mm                                                |
| 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Quality DIN 3967, tolerance block | 8e25*                                                  |
| 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Pressure angle (alpha)            | 20 <sup>0</sup>                                        |
| 8                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Basic rack profile                | DIN 867                                                |
| 9                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Material                          | 42CrMo4V                                               |
| 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Weight                            | 63.5 Kg                                                |
| 11                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Dimensions                        | As per the drawing no.:<br>ISAC-DTDF-DTDP-12-00024/000 |
| <b>SUPPORTING RING FOR THE GEAR SEGMENTS (QTY: 01 No.)</b><br>Note: <ol style="list-style-type: none"> <li>1. The supporting ring is used to support the 3 gear segments to avoid gear deflection/ deformation.</li> <li>2. The supporting ring is required to maintain the radial run out specification of the gear segments as given in the Part drawing. This is required to ensure proper gear meshing and maintain the Center distance between pinion and gear.</li> </ol> |                                   |                                                        |
| <b>CORRESPONDING PINION SPECIFICATIONS (Qty: 02 Nos.)<br/>(MATCHING PINION DRAWING TO BE GIVEN BY OEM)</b>                                                                                                                                                                                                                                                                                                                                                                      |                                   |                                                        |
| <b>Sl.No</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>Description</b>                | <b>Specifications</b>                                  |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Tolerance                         | DIN 3962                                               |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Module, m                         | 10 mm                                                  |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | No. of teeth, z1                  | 14                                                     |
| 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Addendum modification, xm1        | 2.5 (A) mm                                             |
| 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Addendum reduction, km1           | -1.0 mm                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Addendum modification, xm2        | 2.5 mm                                                 |
| 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Pitch circle diameter, d1         | 140 mm                                                 |
| 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Centre distance, a                | 1710 mm                                                |
| 8                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Quality DIN 3967, tolerance block | 6H                                                     |
| 9                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Pressure angle (alpha)            | 20 <sup>0</sup>                                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Helix angle (beta)                | 0 <sup>0</sup>                                         |

|    |                              |                                                        |
|----|------------------------------|--------------------------------------------------------|
|    | No. of teeth (Gear Ring), z2 | 327                                                    |
| 10 | Basic rack profile           | DIN 867                                                |
| 11 | Material                     | 16MNCR5E                                               |
| 12 | Weight                       | ~10 Kg                                                 |
| 13 | Dimensions                   | As per the drawing no.:<br>ISAC-DTDF-DTDP-12-00418/000 |

**Note:**

3. Hole and keyway dimensions in pinion should confirm to the dimensions of Bore diameter and keyway dimensions of Helical Worm Gear Motor – 2 (as supplied by the manufacturer) as given in ANNEXURE – III.
4. Vendor has to submit OEM (Original Equipment Manufacturer) and Guarantee Certificates.

**IMPORTANT NOTE:**

1. THE STANDARD COMPONENTS AS GIVEN ABOVE MUST BE REGULAR PRODUCT OF THE OEM (Original Equipment Manufacturer), REPUTED MAKE WITH ALL THE TECHNICAL DETAILS [CONSISTING OF DETAILED SPECIFICATIONS, LIMITING LOAD/ TORQUE/ MOMENT CAPACITIES OR CURVES, SERVICE LIFE, PRODUCT SELECTION GUIDELINES, MOUNTING AND OPERATING INSTRUCTIONS) AVAILABLE IN THE PRODUCT CATALOG OF THE OEM ALONG WITH NECESSARY ISO STANDARDS & CERTIFICATIONS]
2. THESE ITEMS SHOULD **NOT** BE CUSTOM BUILT OR FABRICATED BY THE VENDOR.
3. DETAILED DIMENSIONAL DETAILS AND INTERFACES ARE PROVIDED IN THE DRAWINGS ENCLOSED.
4. ANY CHANGE IN SPECIFICATIONS WILL LEAD TO THE CHANGE IN DESIGN. HENCE, THE VENDOR SHALL EXERCISE EXTREME CARE WHILE PROCURING THE STANDARD COMPONENTS.

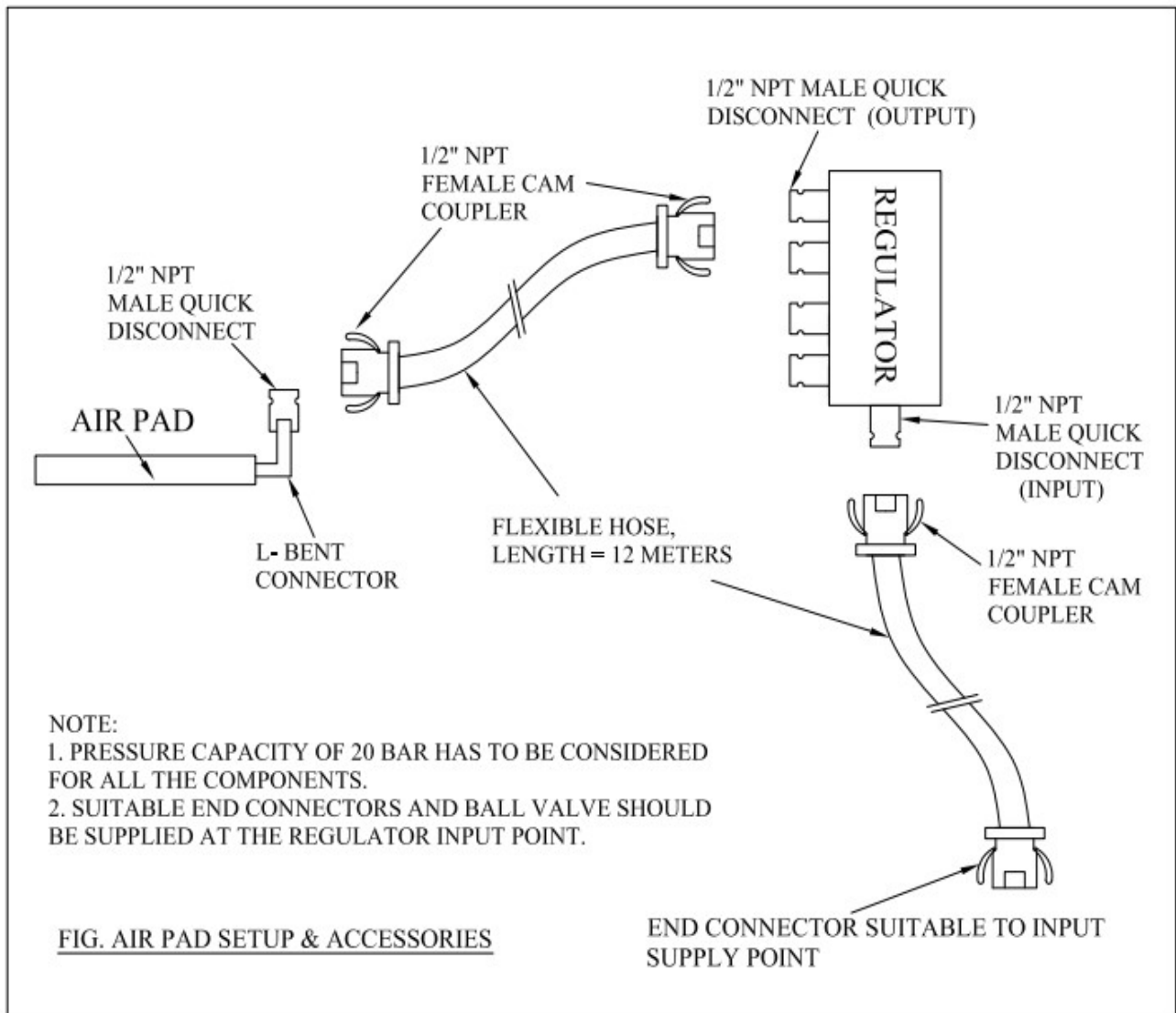
**ANNEXURE – VI**

**SPECIFICATION OF AIR PAD AND ACCESSORIES PER ASSEMBLY**

| Sl. No | Description | Specifications | Quantity<br>(per assembly) | Make |
|--------|-------------|----------------|----------------------------|------|
|--------|-------------|----------------|----------------------------|------|

|                                                                                                 |                                           |                                                                                                                                                                                                                                                                                                       |                                         |                                                         |
|-------------------------------------------------------------------------------------------------|-------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|---------------------------------------------------------|
| 1                                                                                               | Air pad                                   | Air Caster load module with 04 nos. of 15 NHD Aero castors and with SS Quick disconnect fittings (Model no. 4K15NHDL) (refer Figure-1 below)<br>Load capacity: 3855 X 4 Kgs.<br>Dimensions: 384 x 384 x 48 mm<br>Note: Module should have tapped hole & there should not be any hose connected to it. | 01Set.                                  | Aero go Inc.,<br>USA /<br>Equivalent                    |
| 2                                                                                               | L – Bent connector<br>(90° elbow fitting) | To match Air pad and quick disconnect fitting matching to Sl.No.1 (refer Figure-1 below)                                                                                                                                                                                                              | 08 nos.                                 | Aero go Inc.,<br>USA /<br>Equivalent                    |
| 3                                                                                               | Control console with wheels               | BN64 control console with four pressure regulators and gauges, one on/off valve and associated SS quick disconnects to suit the Model no.4K15NHDL.                                                                                                                                                    | 01Set.                                  | Aero go Inc.,<br>USA<br>/Equivalent                     |
| 4                                                                                               | Hoses with Female Cam Coupler on each end | Flexible color coded air hoses to suite the model no. 4K15NHDL with female cam couplers (refer Figure-1 below).<br>Pressure capacity: 20 Bar<br><b>(Flexible Rubber Type – Color coded Hoses (Red, Blue, Green &amp; Black))</b>                                                                      | 04 Nos.<br>Length = 12 meters each      | Aero Go,<br>CDC or<br>Festo /<br>Equivalent make        |
| 5                                                                                               | Female Cam Coupler                        | To suit the male quick disconnect of air pad and control console inlet & outlet points (refer Figure-1 below).<br>Material: SS                                                                                                                                                                        | 04+04+02 Nos.                           | PT coupling company / CDC<br>/Festo/<br>Equivalent make |
| 6                                                                                               | Supply Hose (Hose-2)                      | Flexible Hose with female cam coupler to connect the air supply point to control console inlet point. (Air supply outlet point is 1” SS pipe, ball valve operated).<br>Pressure capacity: 20 Bar<br><b>(Hose: Rubber Type Blue &amp; Green color)</b>                                                 | (01+01) Nos.<br>Length = 12 meters each | CDC /Festo /<br>Equivalent make                         |
| 7                                                                                               | Storage Cart                              | To easily store and move load module systems. Wheels of the storage cart should be suitable the ESD floor specifications.                                                                                                                                                                             | 01                                      | Aero go Inc.,<br>USA/<br>Equivalent                     |
| <b>Figure below</b> shows the schematic representation of the Air Pad Setup and its Accessories |                                           |                                                                                                                                                                                                                                                                                                       |                                         |                                                         |

**Figure - 1**



**ANNEXURE – VII**  
**STANDARD ACCESSORIES PER ASSEMBLY**

| S. No | Item & Quantity per assembly                | Description/ Specifications                                                                                                                                                                                                                                                                                        | Remarks                                                                                                                                        |
|-------|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| 1     | Digital Display Inclinometer (Qty: 04 Nos.) | Specifications: <ul style="list-style-type: none"> <li>• Angle Measuring Range: <math>\pm 15^\circ</math></li> <li>• Accuracy (in degrees): <math>0.005^\circ</math></li> <li>• Repeatability (in degrees): <math>0.003^\circ</math></li> <li>• Angle Resolution (in degrees): <math>0.001^\circ</math></li> </ul> | <ul style="list-style-type: none"> <li>• To be mounted on S/C Adaptor, Drg No. ISAC-DTDF-DTDP-12-00143/000 at 4 locations provided]</li> </ul> |

|   |                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                           |
|---|---------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|   |                                                                                                               | <ul style="list-style-type: none"> <li>• Working temperature: -10<sup>0</sup> C to +70<sup>0</sup> C</li> <li>• Measuring Axis: Single Axis</li> <li>• 2 Magnetic sides</li> <li>• <b>Rechargeable</b></li> <li>• <b>3.7V Charging Lithium Battery</b></li> <li>• Water proof grade: IP54</li> <li>• Size (L x B x H in mm): <b>108mm x 75mm x 27mm</b></li> <li>• LCD visible display size: 57mm x 43mm (approx.)</li> <li>• Weight: <b>350g</b></li> </ul> <p><b>Accessories:</b></p> <ul style="list-style-type: none"> <li>• Suitable charger with connecting line</li> <li>• UKAS certificate</li> </ul> | Model: Taylor Hobson/<br>RION DMI810 / Any other Equivalent                                                                                                                                                                                                                                               |
| 2 | <p>Standard Metric Stainless Steel rules to EC class II reading from Left to Right.</p> <p>(Qty: 02 Nos.)</p> | <ul style="list-style-type: none"> <li>• Product Code: AHD – 150R/3000</li> <li>• Description: Length 3m, Section 30 x 1mm</li> <li>• Supplier: EGL TOOLS.COM</li> <li>• Any equivalent is also acceptable</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                         | <ul style="list-style-type: none"> <li>• The scales are to be bolted to the Moving Frame (Drg. No.: ISAC-DTDF-IGEN-12-06619/002) – for tilt axis angle measurement.</li> <li>• Necessary interface holes to be drilled on the scale for assembly purposes.</li> </ul>                                     |
| 3 | <p>Standard Metric Stainless Steel rules to EC class II reading from Left to Right.</p> <p>(Qty: 02 Nos)</p>  | <ul style="list-style-type: none"> <li>• Product Code: AHD – 150R/4000</li> <li>• Description: Length 4m, Section 30 x 1mm</li> <li>• Supplier: EGL TOOLS.COM</li> <li>• Any equivalent is also acceptable</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                         | <ul style="list-style-type: none"> <li>• The above scales are to be bolted to two adaptors (Drg. Nos.: ISAC-DTDF-IGEN-12-06620/002 &amp; ISAC-DTDF-IGEN-12-08658/000) – for Spin axis angle measurement</li> <li>• Necessary interface holes to be drilled on the scale for assembly purposes.</li> </ul> |

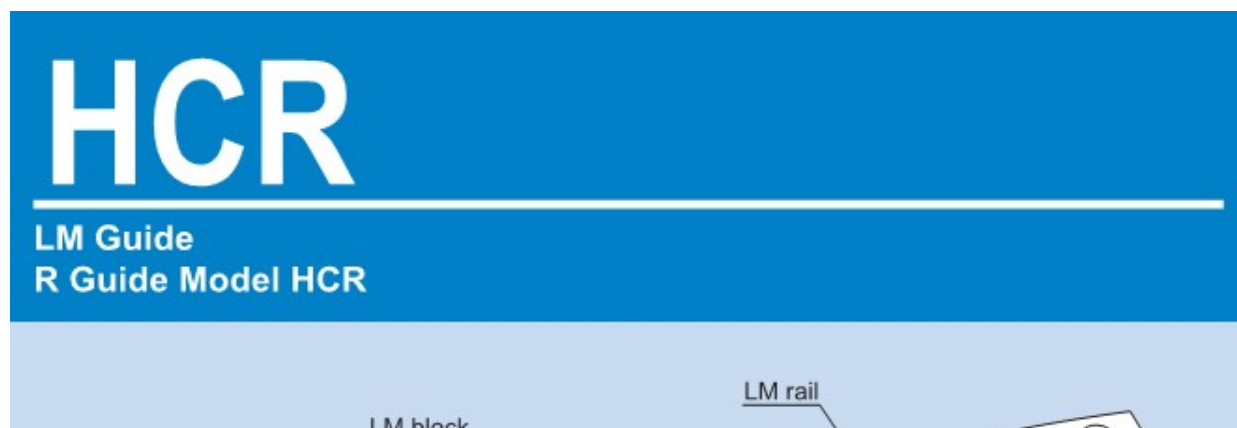
|   |                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|---|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4 | 13mm wide scale measuring tapes | <p><u>Sl. No: 1</u></p> <ul style="list-style-type: none"> <li>• Product Code: FR-SK528-SA/5M / Equivalent</li> <li>• Description: Length 5m,</li> <li>• Reading: left to Right</li> <li>• Qty: 01 No.</li> </ul> <p><u>Sl. No: 2</u></p> <ul style="list-style-type: none"> <li>• Product Code: FR-SK528-SA/3M / Equivalent</li> <li>• Description: Length 3m,</li> <li>• Reading: left to Right</li> <li>• Qty: 01 No.</li> </ul> <ul style="list-style-type: none"> <li>• Supplier:<br/>EGL TOOLS.COM</li> <li>• Any equivalent for Sl. Nos. 1 &amp; 2 above is also acceptable.</li> </ul> | <ul style="list-style-type: none"> <li>• Flat steel measuring tapes for affixing to work surfaces and machinery</li> <li>• 13mm wide nylon coated steel tapes with yellow back-ground, printed with black and red figures and black graduations</li> <li>• Self-adhesive backing on reverse side, protected by plastic tape which is peeled off before affixing.</li> <li>• To be fixed at the curved portion of Moving Frame, Drg No. ISAC-DTDF-DTDP-12-00010/000</li> </ul> |
|---|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

#### ANNEXURE-VIII

##### For Reference: Linear Motion R-Guide mounting Instructions

The guidelines are taken from THK product catalog, similar guidelines to be followed for any equivalent product selected in place of THK.

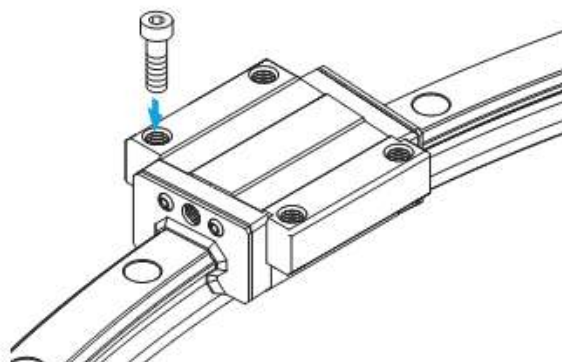
For THK LM Block and Rail assembly/installation and handling precautions, the **Vendor** must follow the procedures and instructions given in THK product catalogs. The **Vendor** should maintain the dimensional accuracies, positional tolerances, parallelism & vertical limit between two rails, mounting/machined surface requirements (parallelism, perpendicularity, flatness, dimensional & machining tolerances), inspection etc., as per THK product catalog and design/fabrication drawings supplied. Some of the important instructions from THK product catalog are given below:



## Model HCR

Specification Table⇒B-168

The flange of its LM block has tapped holes.



# Removing/mounting Jig

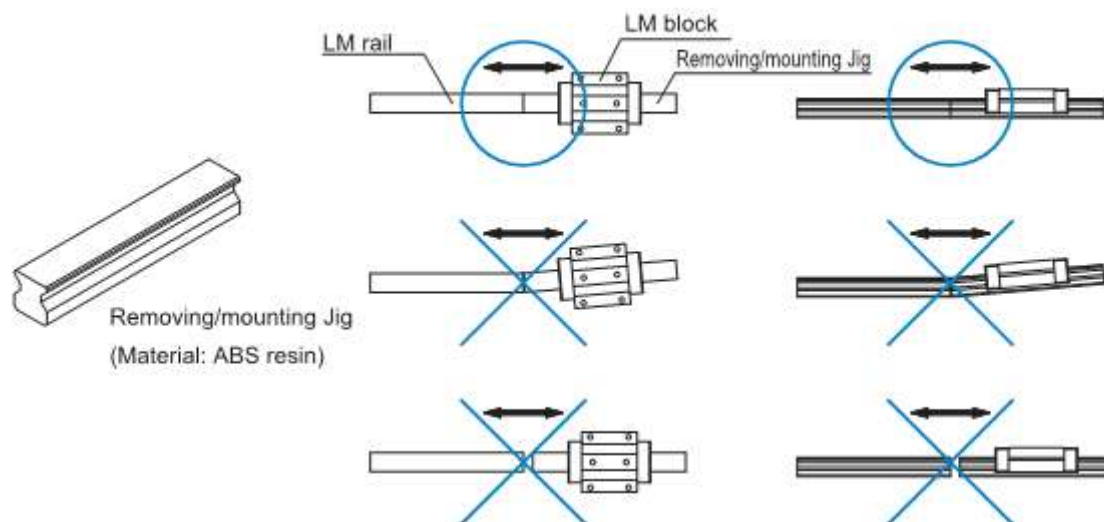
When assembling the guide, do not remove the LM block from the LM rail whenever possible. If it is inevitable to remove the LM block due to the plate cover type or the assembly procedure, be sure to use the removing/mounting jig.

Mounting the LM block without using the removing/mounting jig may cause rolling elements to fall from the LM block due to contamination by foreign material, damage to internal components or slight inclination. Mounting the LM block with some of the rolling elements missing may also cause damage to the LM block at an early stage.

When using the removing/mounting jig, do not incline the jig and match the ends of both LM rails.

If any of the rolling elements falls from the LM block, contact THK instead of using the product.

Note that the removing/mounting jig is not included in the LM Guide package as standard. When desiring to use it, contact THK.



[Procedure for Assembling Model HCR]

To install the LM rails of R Guide model HCR, we recommend having any form of datum point (such as a pin) on the reference side (inside) of the LM rail, and pressing the LM rail to the datum point then stopping the LM rail with a presser plate from the counter-reference surface.

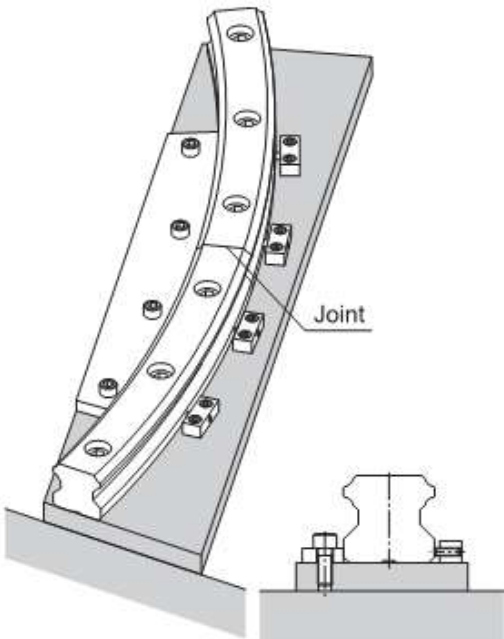


Fig.29 Method for Securing the LM Rails at the Joint

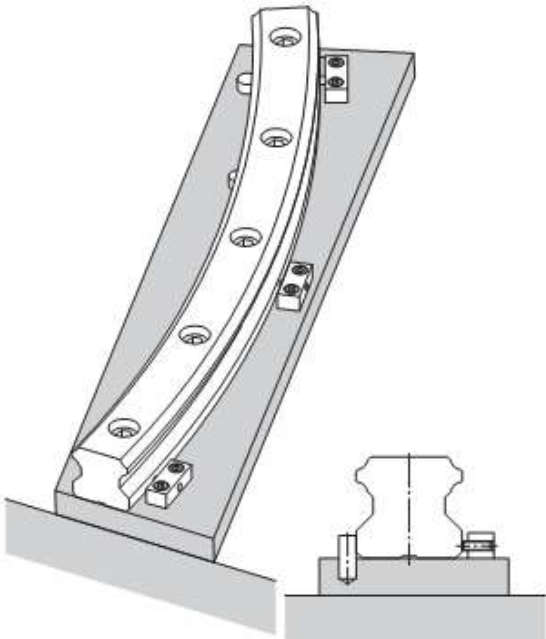


Fig.30 Method for Securing the LM Rail Using a Pin as a Datum Point

Jointed LM rail

[Level Difference Specification for the Joint]

An accuracy error in LM rail installation has influence on the service life of the product. When installing the LM rail, take care to minimize the level difference in the joint within the

Table2 Level Difference Specification for the Joint  
Unit: mm

| Model No. | Ball raceway, | Upper face | Maximum clearance of the joint |
|-----------|---------------|------------|--------------------------------|
|-----------|---------------|------------|--------------------------------|

---

## Permissible Error of the Mounting Surface

---

The LM Guide allows smooth straight motion through its self-aligning capability even when there is a slight distortion or error on the mounting surface.

### [Error Allowance in the Parallelism between Two Rails]

The following tables show error allowances in parallelism between two rails that will not affect the

**[Error Allowance in Vertical Level between Two Rails]**

The values in the tables on A-336 and A-337 represent error allowances in vertical level between two rails per axis-to-axis distance of 500 mm and are proportionate to axis-to-axis distances (200 mm for model RSR).

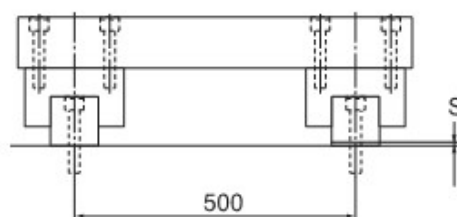


Fig.19 Error Allowance in Vertical Level (S) between Two Rails

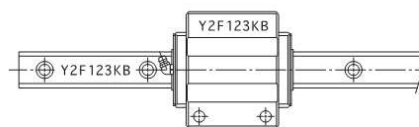


## Marking on the Master LM Guide and Combined Use

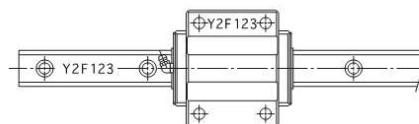
### [Marking on the Master LM Guide]

All LM rails mounted on the same plane are marked with the same serial number. Of those LM rails, the one marked with "KB" after the serial number is the master LM rail. The LM block on the master LM rail has its reference surface finished to a designated accuracy, allowing it to serve as the positioning reference for the table. (See Fig.20.)

LM Guides of normal grade are not marked with "KB." Therefore, any one of the LM rails having the same serial number can be used as the master LM rail.



Master LM Guide



Subsidiary LM Guide

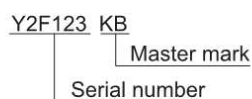
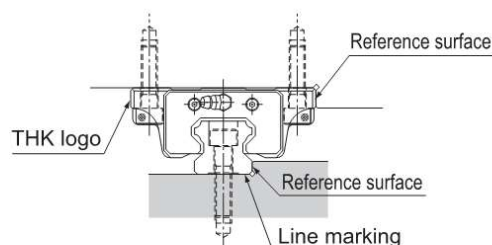


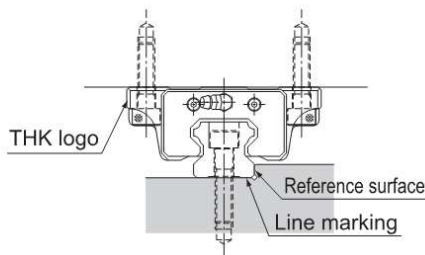
Fig.20 Master LM Guide and Subsidiary LM Guide

### [Markings on the Reference Surface]

In the LM Guide, the reference surface of the LM block is opposite the surface marked with the THK logo, and that of the LM rail is on the surface marked with a line (see Fig.21). If it is necessary to reverse the reference surface of the LM rail and block, or if the grease nipple must be oriented in the opposite direction, specify it.



Master LM Guide



Subsidiary LM Guide

Fig.21 Markings on the Reference Surface

**[Serial Number Marking and Combined Use of an LM Rail and LM Blocks]**

An LM rail and LM block(s) used in combination must have the same serial number. When removing an LM block from the LM rail and reinstalling the LM block, make sure that they have the same serial number and the numbers are oriented in the same direction. (Fig.22)

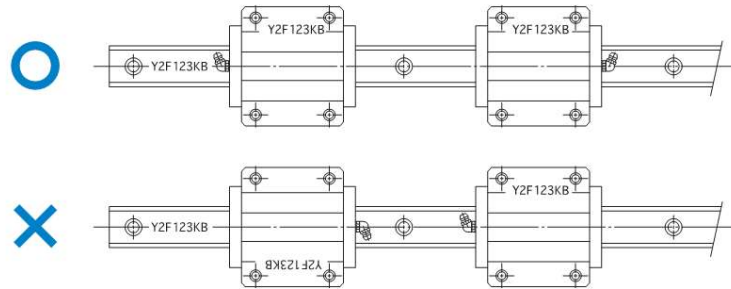


Fig.22 Serial Number Marking and Combined Use of an LM Rail and LM Blocks

**[Use of Jointed Rails]**

When a long LM rail is ordered, two or more rails will be jointed together to the desired length. When jointing rails, make sure that the joint match marks shown in Fig.23 are correctly positioned. When two LM Guides with connected rails are to be arranged in parallel to each other, the two LM Guides will be manufactured so that the two LM Guides are axisymmetrically aligned.

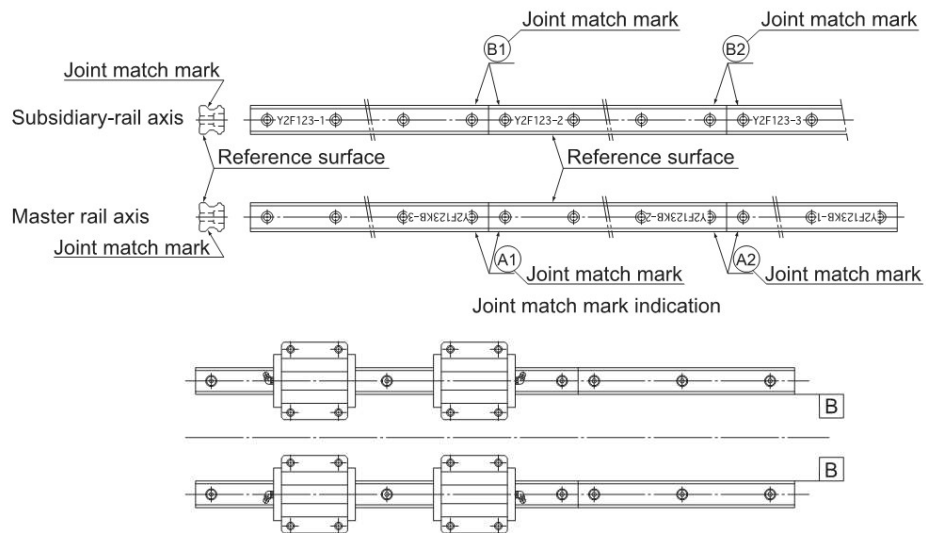


Fig.23 Use of Jointed Rails

## Mounting the LM Guide

### Mounting Procedure

[Example of Mounting the LM Guide When an Impact Load is Applied to the Machine and therefore Rigidity and High Accuracy are Required]

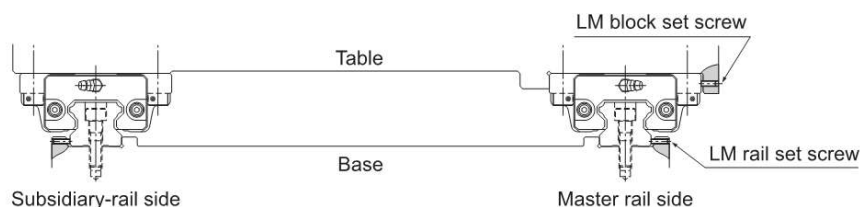


Fig.1 When an Impact Load is Applied to the Machine

#### ● Mounting the LM Rail(s)

- (1) Be sure to remove burr, dent and dust from the mounting surface of the machine to which the LM Guide is to be mounted before installing the LM Guide. (Fig.2)

Note) Since the LM Guide is coated with anti-rust oil, remove it from the reference surface by wiping the surface with washing oil before using the guide. Once the anti-rust oil has been removed, the reference surface is prone to getting rusted. We recommend applying low-viscosity spindle oil.

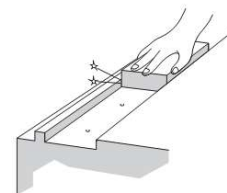


Fig.2 Checking the Mounting Surface

- (2) Gently place the LM rail onto the base, and temporarily secure the bolts to the extent that the LM rail lightly contacts the mounting surface (align the line-marked side of the LM rail with the side reference-surface of the base). (Fig.3)

Note) The bolts for securing the LM Guide must be clean. When placing the bolts into the mounting holes of the LM rail, check if the bolt holes are displaced. (Fig.4) Forcibly tightening the bolt into a displaced hole may deteriorate the accuracy.

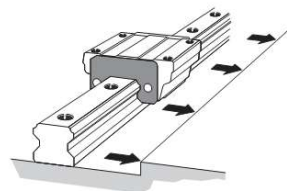


Fig.3 Aligning the LM Rail with the Reference-Surface

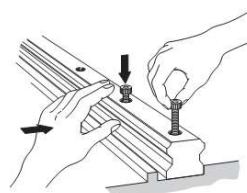


Fig.4 Checking with the Bolt for an Allowance

- (3) Secure the set screws for the LM rail in order with a tightening force just enough to have the rail closely contact the side mounting surface. (Fig.5)

- (4) Tighten the mounting bolts at the designated torque using a torque wrench. (See Fig.6, and Table1 and Table2 on A-350.)

Note) To achieve stable accuracy when tightening the LM rail mounting bolts, tighten them in order from the center to the rail ends.

- (5) Mount the other rail in the same manner to complete the installation of the LM rails.

- (6) Hammer in caps into the bolt holes on the top face of each LM rail until the top of the cap is on the same level as the top face of the rail.

#### ● Mounting the LM Blocks

- (1) Gently place the table on the LM blocks and temporarily fasten the mounting bolts.

- (2) Press the master side LM blocks to the side reference surface of the table using set screws and position the table. (See Fig.1 on A-340.)

- (3) Fully fasten the mounting bolts on the master side and the subsidiary side to complete the installation.

Note) To evenly secure the table, tighten the mounting bolts in diagonal order as shown in Fig.7.

This method saves time in establishing straightness of the LM rail and eliminates the need to machine securing dowel pins, thus to drastically shorten the installation man-hours.

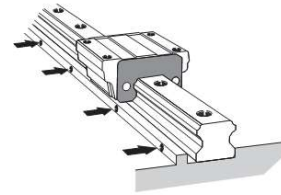


Fig.5 Tightening the Set screws

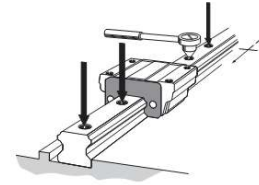


Fig.6 Fully Fastening the Mounting Bolts

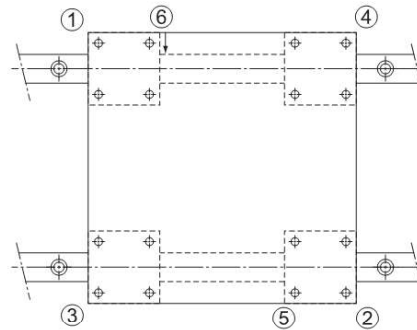


Fig.7 Sequence of Tightening the LM Blocks

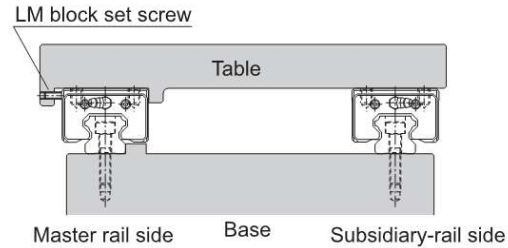


Fig.8 When the Master LM Rail is not Provided with Set screws

#### ● Mounting the Master LM Rail

After temporarily fastening the mounting bolts, firmly press the LM rail to the side reference surface at the position of each mounting bolt using a small vice and fully fasten the bolt. Perform this in order from either rail end to the other. (Fig.9)

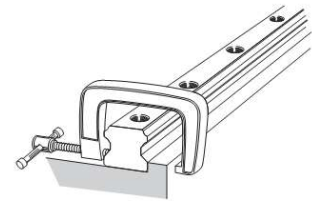


Fig.9

#### ● Mounting the Subsidiary LM Rail

To mount the subsidiary LM rail in parallel with the master LM rail, which has been correctly installed, we recommend adopting the methods below.

##### ■ Using a Straight-edge

Place straight-edges between the two rails, and arrange the straight-edges in parallel with the side reference surface of the master LM rail using a dial gauge. Then, secure the mounting bolts in order while achieving straightness of the subsidiary rail with the straight edge as the reference by using the dial gauge. (Fig.10)

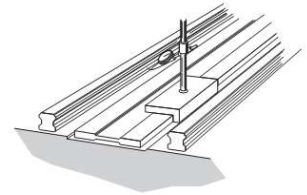


Fig.10

[Example of Mounting the LM Guide When the Master LM Rail Does not Have a Reference Surface]

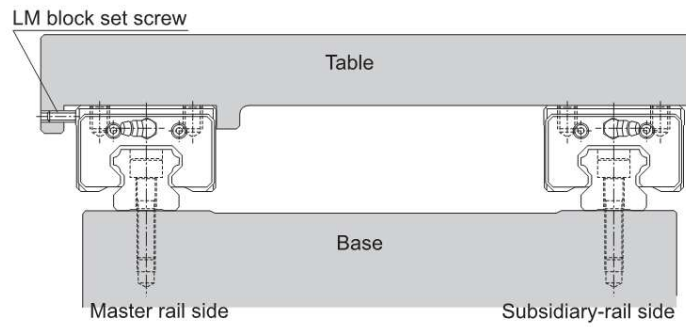


Fig.14

● Mounting the Master LM Rail

■ Using a Temporary Reference Surface

You can temporarily set a reference surface near the LM rail mounting position on the base to achieve straightness of the LM rail from the rail end. In this method, two LM blocks must be joined together and attached to a measurement plate, as shown in Fig.15.

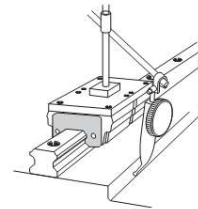


Fig.15

■ Using a Straight-edge

After temporarily fastening the mounting bolts, use a dial gauge to check the straightness of the side reference surface of the LM rail from the rail end, and at the same time, fully fasten the mounting bolts.(Fig.16)

To mount the subsidiary LM rail, follow the procedure described on A-342.

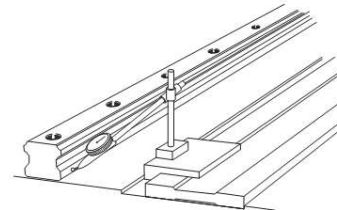


Fig.16

## Methods for Measuring Accuracy after Installation

### [When Measuring Running Accuracy for Single Rail Application]

When measuring running accuracy of the LM block, stable accuracy can be obtained by securing two LM blocks on an inspection plate, as shown in Fig.31. When using a dial gauge, we recommend placing the straight-edge as close as possible to the LM block in order to perform accurate measurement.

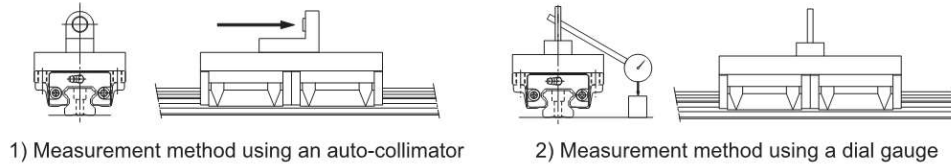


Fig.31 Methods for Measuring Accuracy after Installation

## Recommended Tightening Torque for LM Rails

With high-precision LM rails for the LM Guide, their raceways are ground and accuracy is inspected with the rails tightened with bolts. When mounting a high-precision LM rail on a machine, we recommend using the corresponding tightening torque indicated in Table1 or Table2

Table1 Tightening Torques when Pan Head Screws are Used  
Unit: N-cm

| Screw model No. | Tightening torque |          |
|-----------------|-------------------|----------|
|                 | Not hardened      | Hardened |
| M 2             | 17.6              | 21.6     |
| M 2.3           | 29.4              | 35.3     |
| M 2.6           | 44.1              | 52.9     |

Table2 Tightening Torques when Hexagonal-Socket-Head Type Bolts are Used  
Unit: N-cm

| Screw model No. | Tightening torque |         |          |
|-----------------|-------------------|---------|----------|
|                 | Iron              | Casting | Aluminum |
| M 2             | 58.8              | 39.2    | 29.4     |
| M 2.3           | 78.4              | 53.9    | 39.2     |
| M 2.6           | 118               | 78.4    | 58.8     |
| M 3             | 196               | 127     | 98       |
| M 4             | 412               | 274     | 206      |
| M 5             | 882               | 588     | 441      |
| M 6             | 1370              | 921     | 686      |
| M 8             | 3040              | 2010    | 1470     |
| M 10            | 6760              | 4510    | 3330     |
| M 12            | 11800             | 7840    | 5880     |
| M 14            | 15700             | 10500   | 7840     |
| M 16            | 19600             | 13100   | 9800     |
| M 20            | 38200             | 25500   | 19100    |
| M 22            | 51900             | 34800   | 26000    |
| M 24            | 65700             | 44100   | 32800    |
| M 30            | 130000            | 87200   | 65200    |



**ASSEMBLY INSPECTION**

**&**

**LOAD TEST**

**DRAWINGS**





2. MARKING OF ANGLES FOR EVERY 10° TO BE DONE ON SCALES PROVIDED AS GIVEN BELOW:

TILT AXIS SCALE: 0-90°  
SPIN AXIS SCALE: 0-360°

SPIN AXIS SCALE: 0-360°  
AXIS-A, AXIS-B, AXIS-C WHICH

3. SPIN AXIS SCALE: 0-360  
AXIS-A' AXIS WHICH IS PERPENDICULAR TO THE  
MOUNTING MACHINED SURFACE OF BASE FRAME/INTRFACE ADAPTOR.

4. PASSING THROUGH THE CENTRE OF THE INTERFACE ADAPTOR.

AXIS-C, IS THE AXIS PASSING THROUGH THE CENTRE OF THE SPACECRAFT MOUNTING ADAPTOR.

|        |                   |      |
|--------|-------------------|------|
| REV NO | NOTES OF REVISION | ZONE |
| 00     | BASE LINE DRAWING | N/A  |

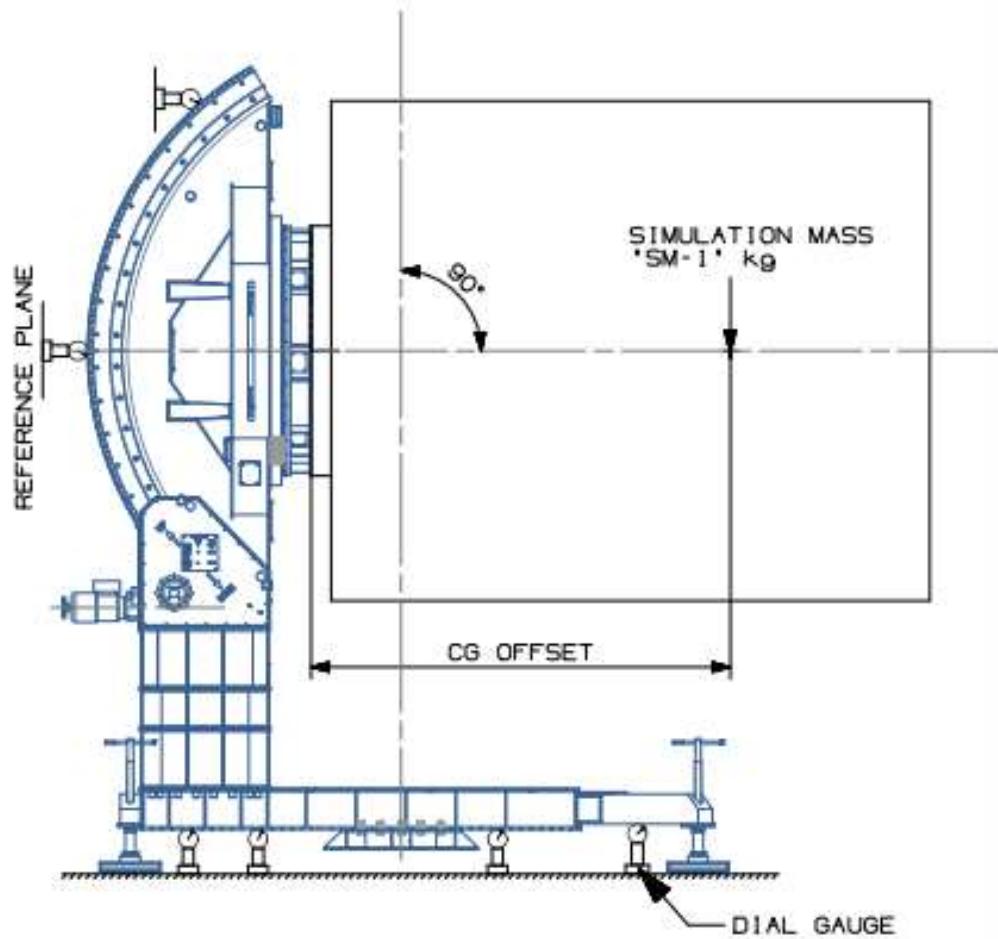
  

NOTE:

1. SIMULATION MASS 'SM-1' = 4500kg  
CG OFFSET FROM MOUNTING SURFACE = 2.2m.  
(MASS TO BE LOADED IN STEPS OF 500 kg)
2. NO. OF DIAL GAUGES REQUIRED FOR DEFLECTION MEASUREMENT IS 8.

|                                                                                                                                               |      |      |      |                                                                             |                                                                                         |                             |  |    |
|-----------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-----------------------------|--|----|
| *GENERAL TOLERANCE AS PER ISO 2768-M.<br>*DO NOT SCALE THE DRAWING UNLESS OTHERWISE STATED.<br>*DIMENSIONS ARE IN MM.<br>*REMOVE SHARP EDGES. |      |      |      | TITLE<br><b>STATIC LOAD TEST (0°)</b><br>(SPACECRAFT POSITIONER MODEL 3000) |                                                                                         | SCALE<br><b>NTS</b>         |  |    |
| APPROVED                                                                                                                                      | NAME | SIGN | DATE |                                                                             | GOVERNMENT OF INDIA - DEPARTMENT OF SPACE<br>ISRO SATELLITE CENTRE<br>BANGALORE - INDIA |                             |  |    |
| DESIGNER                                                                                                                                      |      |      |      |                                                                             |                                                                                         |                             |  |    |
| MOD.CHKD                                                                                                                                      |      |      |      |                                                                             |                                                                                         |                             |  |    |
| DRG.CHKD                                                                                                                                      |      |      |      |                                                                             |                                                                                         |                             |  |    |
| DRAWN                                                                                                                                         |      |      |      | PROJECT                                                                     | GROUP                                                                                   | DRG NO.                     |  |    |
|                                                                                                                                               |      |      |      | 1GEN                                                                        | S16                                                                                     | ISAC-DTDF-DTDP-12-00005/C01 |  | A4 |

|        |                   |      |
|--------|-------------------|------|
| REV NO | NOTES OF REVISION | ZONE |
| 00     | BASE LINE DRAWING | N/A  |



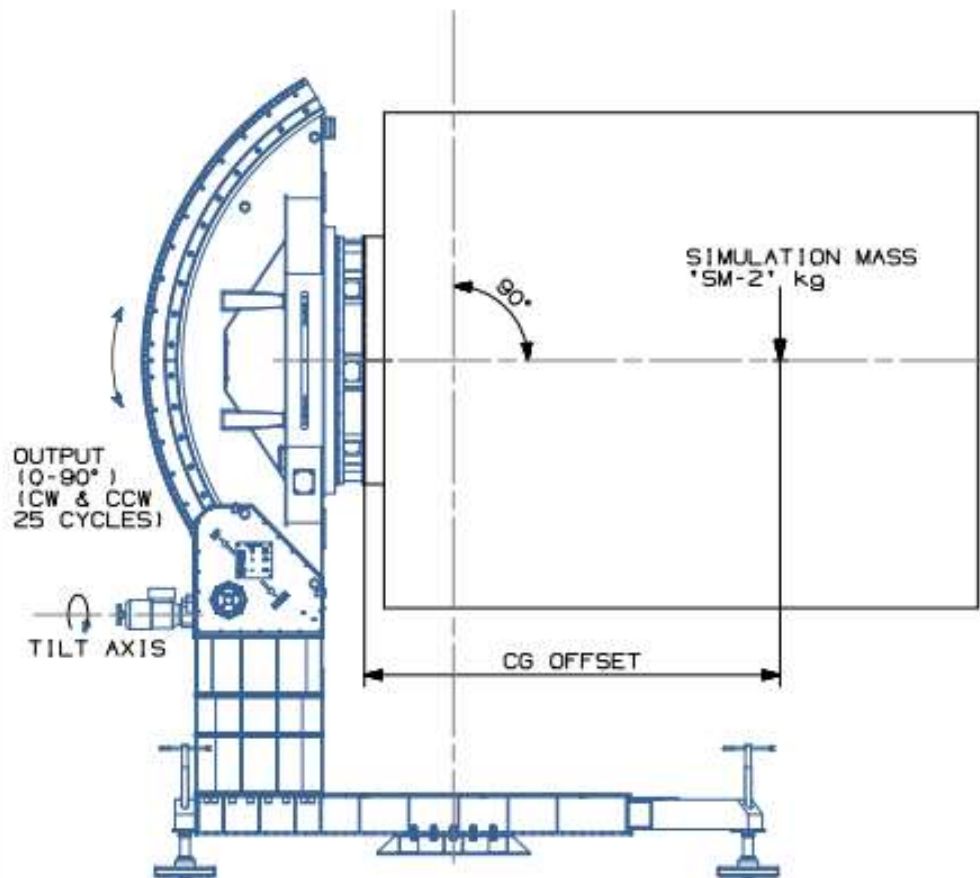
**NOTE:**

1. SIMULATION MASS 'SM-1' = 4500kg  
CG OFFSET FROM MOUNTING SURFACE = 2.2m.  
(MASS TO BE LOADED IN STEPS OF 500 kg)
2. NO. OF DIAL GAUGES REQUIRED FOR DEFLECTION MEASUREMENT IS 8.

|                                                                                                                                               |      |      |      |                                                                                     |                                                                                         |                                        |              |                                                                                       |
|-----------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|----------------------------------------|--------------|---------------------------------------------------------------------------------------|
| *GENERAL TOLERANCE AS PER ISO 2768-M.<br>*DO NOT SCALE THE DRAWING UNLESS OTHERWISE STATED.<br>*DIMENSIONS ARE IN MM.<br>*REMOVE SHARP EDGES. |      |      |      | TITLE<br>STATIC LOAD TEST (90° )<br>(SPACECRAFT POSITIONER MODEL 3000)              |                                                                                         |                                        | SCALE<br>NTS |                                                                                       |
|                                                                                                                                               | NAME | SIGN | DATE |  | GOVERNMENT OF INDIA - DEPARTMENT OF SPACE<br>ISRO SATELLITE CENTRE<br>BANGALORE - INDIA |                                        |              |  |
| APPROVED                                                                                                                                      |      |      |      |                                                                                     |                                                                                         |                                        |              |                                                                                       |
| DESIGNER                                                                                                                                      |      |      |      |                                                                                     |                                                                                         |                                        |              |                                                                                       |
| MOD,CHKD                                                                                                                                      |      |      |      |                                                                                     |                                                                                         |                                        |              |                                                                                       |
| DRS,CHKD                                                                                                                                      |      |      |      |                                                                                     |                                                                                         |                                        |              |                                                                                       |
| DRAWN                                                                                                                                         |      |      |      | PROJECT<br>IGEN                                                                     | GROUP<br>516                                                                            | DRG NO.<br>ISAC-DTDF-DTDP-12-00005/C02 |              | A4                                                                                    |

\*ISRO SATELLITE CENTRE, 11 MARKING IS CAPTIVE TO ISRO OF  
 IN PART, USED FOR MANUFACTURE OR CONSTRUCTION, DISCLOSED  
 WITHOUT PRIOR WRITTEN CONSENT OF ISRO SATELLITE CENTRE

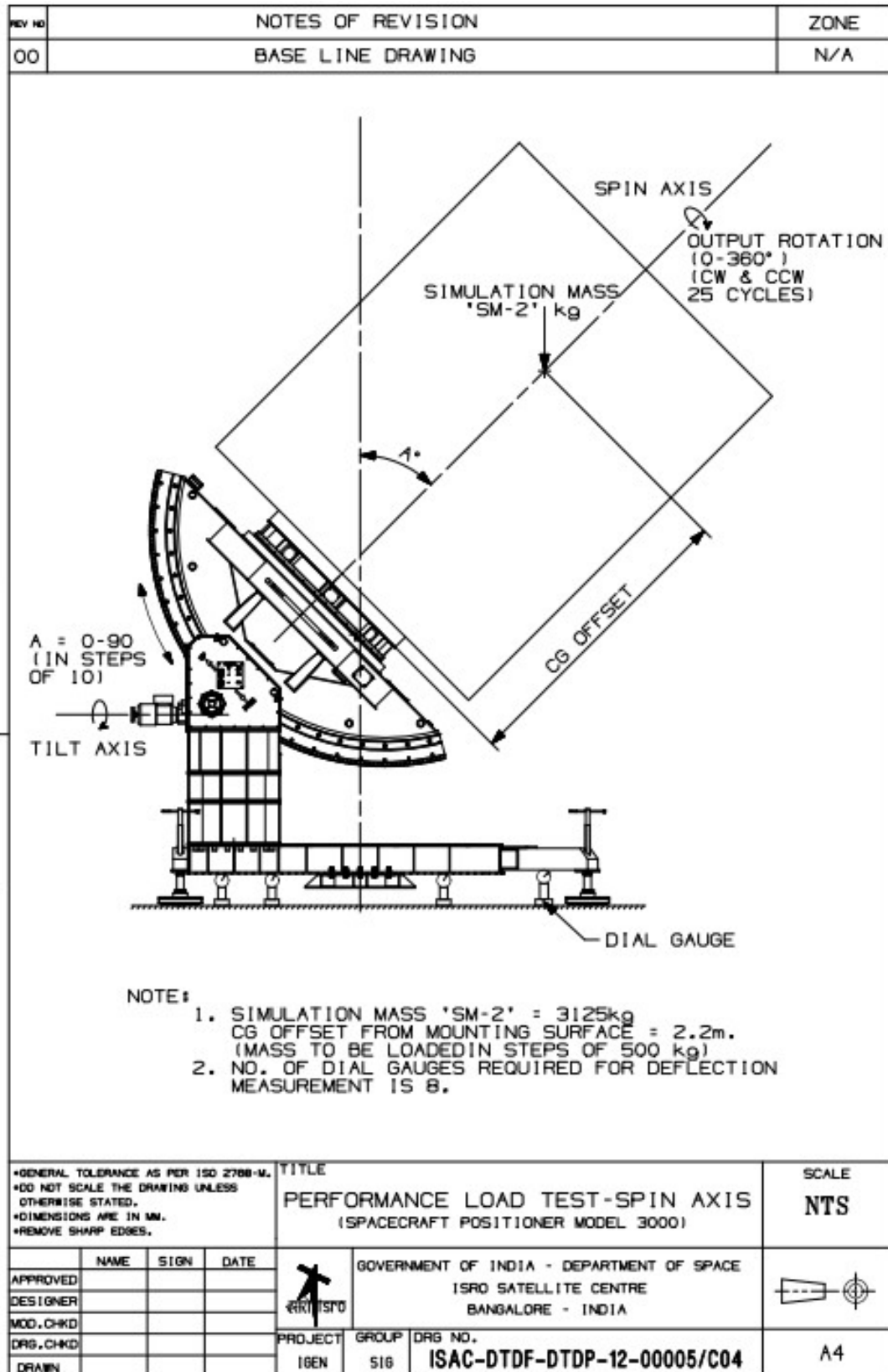
|        |                   |      |
|--------|-------------------|------|
| REV NO | NOTES OF REVISION | ZONE |
| 00     | BASE LINE DRAWING | N/A  |



**NOTE:**

1. SIMULATION MASS 'SM-1' = 3125kg  
CG OFFSET FROM MOUNTING SURFACE = 2.2m.  
(MASS TO BE LOADED IN STEPS OF 500 kg)
2. NO. OF DIAL GAUGES REQUIRED FOR DEFLECTION MEASUREMENT IS 8.

|                                                                                                                                               |      |      |      |                                                                                                                                                                             |                                                                                       |                                               |
|-----------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|-----------------------------------------------|
| *GENERAL TOLERANCE AS PER ISO 2768-M.<br>*DO NOT SCALE THE DRAWING UNLESS OTHERWISE STATED.<br>*DIMENSIONS ARE IN MM.<br>*REMOVE SHARP EDGES. |      |      |      | <b>TITLE</b><br><b>PERFORMANCE LOAD TEST-TILT AXIS</b><br>(SPACECRAFT POSITIONER MODEL 3000)                                                                                |                                                                                       | <b>SCALE</b><br><b>NTS</b>                    |
| APPROVED                                                                                                                                      | NAME | SIGN | DATE |  GOVERNMENT OF INDIA - DEPARTMENT OF SPACE<br>ISRO SATELLITE CENTRE<br>BANGALORE - INDIA |  | <b>A4</b>                                     |
| DESIGNER                                                                                                                                      |      |      |      |                                                                                                                                                                             |                                                                                       |                                               |
| MOD. CHKD                                                                                                                                     |      |      |      |                                                                                                                                                                             |                                                                                       |                                               |
| DRG. CHKD                                                                                                                                     |      |      |      |                                                                                                                                                                             |                                                                                       |                                               |
| DRAWN                                                                                                                                         |      |      |      | PROJECT<br>IGEN                                                                                                                                                             | GROUP<br>S16                                                                          | DRG NO.<br><b>ISAC-DTDF-DTDP-12-00005/C03</b> |



## **Procedure for finalising Contract**

### **Execution of Fabrication, Assembly, Testing and Supply Spacecraft Positioner**

The entire exercise of selecting viable vendors is carried out in two stages i.e. Expression of Interest (EOI) stage and Request for Proposal (RFP) Stage. The following is the flow chart depicting the structure process flow that would be adopted in the vendor selection process.

#### **Steps:**

- 1) Call for Expression of interest
- 2) Pre EOI conference
- 3) EOI Response Submission
- 4) Technical & Managerial Competence Audit EOI Evaluation & short listing of Vendors of RFP
- 5) Release of Request for proposal (RFP)
- 6) RFP Response submission in Two part
- 7) Opening of Price Bid
- 8) Vendor Commercial Evaluation & selection

Note: Vendors qualified in EOI will be given opportunity to participate in tendering process

## **1. Terms and Conditions**

### **1.1 Terms and Conditions: Finance**

This EOI is for Fabrication, Assembly, Testing and Supply of Spacecraft Positioner does not have any relation with respect to the previous Tender floated for similar activities.

## **1.2 Terms & Conditions: Organization Portfolio**

- The applicant may be a Proprietorship, Registered Partnership Firm, One Person Company (OPC), Indian Company/Domestic Company-Private or Public Company-Listed or Unlisted. Vendor shall submit the interesting the given EOI response sheet
- An Indian Company would be deemed to be owned by Indian Citizen and by an Indian Company if more than 51 percent of equity interest in the company is beneficially owned by Resident Indian Citizens and Indian Companies that are, in turn, ultimately owned and controlled by Resident Indian Citizens.
- Control has been defined as the right to appoint the majority of the Directors or to control management and policy decisions, including by virtue of their shareholdings or management rights or shareholders or agreement or voting arrangements.
- The applicant must be registered in India as required by law with minimum three years of continuous operation up to the date of publication of this EOI.
- The vendor should also have a valid GST registration. The Vendor should submit Self attested copies of the Certificates of Incorporation and other certificates that are legally required for carrying out its business activities in India.
- The certificates should be valid at the time of EOI submission and should be certified by an authorized signatory. A copy of PAN Card should also be submitted.
- Income Tax Returns of the last three assessment years duly certified by a Chartered Accountant has to be submitted.
- An undertaking (self-certificate) is to be submitted that, the Organization hasn't been blacklisted by any Central/ State Government Department/ Central Government funded organizations/ State Government funded organizations/ World Bank, or other World Bank organizations and is not under any illegal expression by Government of India.

- The applicant, should not have, during the last three years, either failed to perform on any agreement, or been expelled from any project or agreement or have any agreement terminated for breach by the applicant.
- Persons who are individually or institutionally, in any manner, involved with the selection/screening process of the EOI, and employees of ISRO/URSC are ineligible for applying.
- An undertaking (self-attested) is to be submitted that there has been no outstanding bankruptcy, judgment or pending legal action that could impair operating as a going Concern. Also the Vendor must be solvent, in the Legal Court of Law

### **1.3 Terms & Conditions: General**

- This EOI is not an offer and is issued with no commitment. URSC reserves the right to withdraw the EOI or change or vary any part thereof at any stage. URSC also reserves the right to disqualify any vendor/proposal, should it be so necessary at any stage.
- Timing and sequence of events resulting from this EOI shall ultimately be determined by URSC.
- By submitting the EOI proposal, each vendor shall be deemed to acknowledge that the vendor has carefully read all chapters of this EOI, and has fully informed himself as to all existing terms and conditions.
- The EOI and all correspondence and documents shall be written in English.
- Vendor shall compulsorily fill up the Response format and compliance matrix
- **Participation of Vendors for Pre-EOI Meeting:** A Pre-EOI Meeting will be arranged at UR Rao Satellite Centre, Bengaluru in order to have a better understanding of the EOI document with regard to Technical and Commercial aspects, clarify doubts if any, and other allied details. Interested vendors are requested to take part in the Pre-EOI meeting.
- **Non-Disclosure Agreement:** All documents prepared for fabrication, assembly, testing procedures, drawings, schematics and any other communication revealed during the project will be exclusive property of URSC and vendor shall have no right whatsoever on them and shall not disclose to any other person/party not involved in the execution of the allotted work.

- Further, the vendor must not quote any of these works in any publications or to any of their customers/public domain without explicit permission from URSC and adhere to strict confidentiality.

**GST Registration:**

**IMPORTANT NOTE:**

Government of India has implemented Goods and Services Tax [GST] w.e.f 01.07.2017. The Vendor should mandatorily possess a valid GSTIN along with the GST Registration Certificate.

**2. Secrecy and Security**

- All documents prepared for test procedures, log books, drawings, schematics and any other communications, codes revealed during the process realization will be exclusive property of URSC and vendor shall have no right what so ever on them.
- These documents are to be strictly confidential and should not be reproduced, copied / transmitted to any media
- Further, the vendor must not quote any of these works in any publications or to any of their customers without explicit permission from URSC and adhere to strict confidentiality.

**3. Eligibility and Evaluation criteria**

**Eligibility Criteria:**

- i. The Bidder should be a company registered under Indian Companies Act 1956 or a firm registered under Limited Liability Partnership (registered under LLP Act, 2008). The industry should have been in existence for a minimum of three years in India.
- ii. Vendor shall mandatorily submit ISO 9001: 2015 / aerospace AS9100D certification.
- iii. The realization of SPACECRAFT POSITIONER requires skilled & experienced work force as it is being interfaced and executed directly on the spacecraft. Vendor shall have good experience in realization this kind of critical systems. As the activity concerns safety, protection

aspects & critical sequences, it is mandatory to provide/submit documents with aerospace/ space sector in the domain of mechanical system realization & testing or of similar nature as proof.

- iv. Vendor shall have minimum infrastructure having covered industrial shed, smooth floor surface with strong foundation, welding facilities, machining centers and testing and inspection equipment. Submit proof in the form of document, photographs and address. URSC reserves the right to inspect the same, if required.
- v. The bidder should not have been blacklisted by any Central/State Government institution. A signed declaration to this effect must be submitted along with the EOI response.

**Note:** Start-up and MSME companies/organizations shall also satisfy the above-mentioned eligibility and evaluation criteria.

#### **4. TECHNICAL Evaluation Process:**

- a) URSC will evaluate the responses of the bidders.
- b) The engineers by URSC shall evaluate the responses to the EOI and all supporting documents & documentary evidence. Inability to submit requisite supporting documents or documentary evidence, lead to rejection of the EOI proposal.
- c) Bidder need to submit the supporting documents as per technical evaluation matrix. Each of the responses shall be evaluated to validate compliance of the bidders according to the eligibility criteria.
- d) The decision of the TEC in the evaluation of responses to the EOI shall be final. No correspondence will be entertained outside the evaluation process of the Committee.
- e) To evaluate the proposals, URSC reserves the right to visit the premises of industries participated in EOI with a notice of 24 hours. The evaluation of vendors will be based on response forms and verification of the same during the industry visit.
- f) The TEC may ask for presentation / meetings / clarifications with the bidders to evaluate its EOI response.
- g) The TEC reserves the right to reject EOI responses.

- h) A Request for Proposal (RFP) will be issued only to the short- listed (technically qualified) agencies from this EOI and asked to submit their detailed techno-commercial bid in two parts.

### 13. Technical Evaluation Matrix

| IN-HOUSE/ OUTSOURCE FACILITES AT VENDOR PREMISES |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |       |                    |
|--------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|--------------------|
| Sl.No                                            | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Marks | Response Form      |
| 1.                                               | <b>Facilities</b> <ul style="list-style-type: none"> <li>Covered Fabrication Shop with Area 10mx6m with 8metes (minimum) height for carrying out Fabrication activities<br/>[In-house=10marks; Outsource= 0marks]</li> <li>EOT crane with capacity minimum of 10-ton, cross travel minimum 4 meters and vertical travel 6 meters.<br/>[In-house=5marks; Outsource= 0marks]</li> <li>Assembly Floor area of dimensions 6x3m with height of 6meteres. Floor area shall be dusting free and smooth surface for assembly and testing operations.<br/>[In-house=10marks; Outsource= 0marks]</li> </ul> | 25    | Form F: Annexure-1 |

|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |    |                    |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|--------------------|
| 2. | <b>Fabrication</b><br>Demonstrate past experience in handling complex fabrication specifically. <ul style="list-style-type: none"> <li>MS welded Structures<br/>[In-house=10marks; Outsource= 0marks]</li> <li>Availability of certified and qualified welders for welding IS2062 and SS304 materials<br/>[In-house=10marks; Outsource= 0marks]</li> <li>Availability of Vibration Stress relieving system<br/>[In-house=5marks; Outsource= 3marks]</li> </ul>                                                                                                                                           | 25 | Form F: Annexure-2 |
| 3. | <b>Metrology</b><br>1) The vendor must possess operational and calibrated dimensional inspection equipment including but not limited to <ul style="list-style-type: none"> <li>Surface plate 1.5mx5m<br/>[In-house=1marks; Outsource= 0marks]</li> <li>Electronic Micrometer and Digital caliper<br/>[In-house=1marks; Outsource= 0marks]</li> <li>Precision Feeler gauges<br/>[In-house=1marks; Outsource= 0marks]</li> <li>Digital dial gauges with 50-100 mm stroke<br/>[In-house=1marks; Outsource= 0marks]</li> <li>Thread plug and Ring gauges<br/>[In-house=1marks; Outsource= 0marks]</li> </ul> | 10 | Form F: Annexure-3 |

|    |                                                                                                                                                                                                                                               |    |                    |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|--------------------|
|    | 2) Availability of NDT inspection facilities for testing the welding defects and precision components<br><b>[In-house=5marks; Outsource=2marks]</b>                                                                                           |    |                    |
| 4. | Capability in executing precision Assembly and alignment jobs which includes linear motion guides, power screw, AC induction motor, Gear boxes, slewing ring bearings etc.<br><b>[In-house=10marks; Outsource= 0marks]</b>                    | 10 | Form F: Annexure-4 |
| 5. | Capability of testing of welded structures of dimension 5mx2m using simulation mass minimum of 3 Ton<br><b>[In-house=5marks; Outsource= 0marks]</b>                                                                                           | 5  | Form F: Annexure-5 |
| 6. | <b>Capability of Generation of Fabrication Drawings</b> <ul style="list-style-type: none"> <li>• Generation of Fabrication drawings in Siemens NX Software following drawing standards</li> </ul> <b>[In-house=5marks; Outsource= 3marks]</b> | 5  | Form F: Annexure-6 |
| 7. | <b>Raw Material and Standard Bought Out items</b> <ul style="list-style-type: none"> <li>• Certification of raw material as per NABL standards</li> </ul> <b>[In-house=1marks; Outsource= 1marks]</b>                                         | 3  | Form F: Annexure-7 |

|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |    |                    |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|--------------------|
|    | <ul style="list-style-type: none"> <li>• Capability in archival and traceability of Raw materials form initial phase to final phase of fabrication<br/><b>[In-house=1marks; Outsource= 1marks]</b></li> <li>• Capability in Procurement of standard items likes linear motion guides, power screw etc<br/><b>[In-house=1marks; Outsource= 1marks]</b></li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |    |                    |
| 8. | <b>Machining</b> <ol style="list-style-type: none"> <li>Availability of CNC machining facility (min 3axis) with minimum bed size of 4mx3m, with vertical travel of 1.6m <ul style="list-style-type: none"> <li>• CNC Milling Machine<br/><b>[In-house=3marks; Outsource= 2marks]</b></li> <li>• CNC Turning machine<br/><b>[In-house=3marks; Outsource= 2marks]</b></li> <li>• CNC Vertical machining centers<br/><b>[In-house=3marks; Outsource= 2marks]</b></li> </ul> </li> <li>Availability of Heavy machineries <ul style="list-style-type: none"> <li>• Plano Milling machines<br/><b>[In-house=1marks; Outsource= 1marks]</b></li> <li>• Vertical turret Lathes<br/><b>[In-house=1marks; Outsource= 1marks]</b></li> <li>• Radial Drilling machines<br/><b>[In-house=1marks; Outsource= 1marks]</b></li> </ul> </li> </ol> | 12 | Form F: Annexure-8 |
| 9. | <b>Electrical Activities</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 5  | Form F: Annexure-9 |

|                       |                                                                                                                                                                                   |     |  |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|--|
|                       | Capability in PLC programming and Integration of electrical components like MCB, VFD, HIM, relays, contacts, Limit switches, Sensors etc.<br>[In-house=5marks; Outsource= 2marks] |     |  |
| <b>OVER ALL MARKS</b> |                                                                                                                                                                                   | 100 |  |

Note:

- Vendor has to clearly indicate whether activities are performed using in-house facilities or outsource facilities
- If Vendor is outsourcing, completely details of outsourcing party shall be furnished during submission of EOI
- Vendor will be qualified in EOI only if vendor scores  $\geq 75$  marks

## 5. RESPONSE FORMS AND ANNEXURES

**FORM A, B, C, D and E are mandatory forms to be filled by vendor. Without submission of these forms, FORM F will not be considered and vendor will not become eligible EOI.**

### Form – A: General details of the industry

|   |                                                                   |                                                                                                           |
|---|-------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| 1 | Name of the Industry                                              |                                                                                                           |
| 2 | Year of Establishment                                             |                                                                                                           |
| 3 | Core capabilities of the industry                                 | Type brief profile of the industry not more than 2 pages (Any other report/s can be provided as Annexure) |
| 4 | Head office location and address with contract number & email id: |                                                                                                           |

|   |                                                                                                                                     |               |
|---|-------------------------------------------------------------------------------------------------------------------------------------|---------------|
| 5 | Local address in Bangalore, if any, with contact number & email id:                                                                 |               |
| 6 | Addresses of manufacturing and/or operational setup in India (highlight the address where ISAC representative will visit for audit) | 1.<br>2.<br>3 |
| 7 | Corporate website URL:                                                                                                              |               |

**Form B - Experience in Aerospace sector:** in case the industry is having/had any Purchase order/work order/contract (not more than 6 Purchase orders) from June 01, 2020 onwards in Skilled, manpower engaged for realization of fixtures for aerospace industries, provide the details in the specified format for each work order.

**Document-1**

|                                                                                             |                                                       |
|---------------------------------------------------------------------------------------------|-------------------------------------------------------|
| Name of the Aerospace Industry                                                              |                                                       |
| Scope of work                                                                               |                                                       |
| PO Details                                                                                  |                                                       |
| Present Status of the PO                                                                    |                                                       |
| Type of System*                                                                             |                                                       |
| Application **                                                                              |                                                       |
| In any part of the above work subcontracted to other industries. If yes provide the details |                                                       |
| Name of the sub-contracts                                                                   | Description of activity outsourced to sub-contractors |

|  |  |
|--|--|
|  |  |
|--|--|

**Form C - Financial Details**

**Financial information of Industry /Lead Industry in case of consortium**

| Heads                                       | FY 2022-23 | FY 2023-24 | FY 2024-25 |
|---------------------------------------------|------------|------------|------------|
| Revenue from operations (in INR Crores)     |            |            |            |
| EBTD (Earnings Before Tax and Depreciation) |            |            |            |
| % of Revenue from Aerospace Segment/Unit    |            |            |            |
| Net Worth                                   |            |            |            |
| Share capital                               |            |            |            |
| % of shareholding by Indian                 |            |            |            |
| % of Shareholding by Foreign                |            |            |            |

**Form D: Mandatory supporting documents**

- I. Auditor certified statements for the last three years, FY 2022-2023, FY 2023-24 and FY 2024-25 as Annexure (please provide the profit and loss statement and balance sheet)
- II. Unaudited certified statements certified by the company auditors for the latest year 2025-26 (in case auditor certified statement

for 2024-25 is not available). Certification by the company auditors supporting the revenue break up.

**Form E: Quality Management:**

|   |                                                                                      |                                                                                                                                                                                                                            |                                          |
|---|--------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| 1 | State the quality policy of the industry<br>(max in 200 words)                       | (type overall quality management system and mention about quality department reporting, non-conformance management system, quality control practices, records maintenance, onsite activity QMS, internal review mechanism) |                                          |
| 2 | Quality standards /certification obtained by the Industry [Tick the appropriate box] | <input type="checkbox"/>                                                                                                                                                                                                   | AS9100Rev C                              |
|   |                                                                                      | <input type="checkbox"/>                                                                                                                                                                                                   | Applicable as per ISO 9001 standard      |
|   |                                                                                      | <input type="checkbox"/>                                                                                                                                                                                                   | Others<br><br>(if others kindly mention) |

**Form F**

Mandatory Requirements: Failure to demonstrate full compliance ("Complied") with any item in FORM F annexures shall result in the immediate disqualification of the vendor. These criteria are non-negotiable conditions for execution of job

Evidence: The vendor must reference specific annexures or page numbers in the "Remarks/Supporting Documents" column where proof of compliance can be verified

|                   |
|-------------------|
| <b>Annexure-1</b> |
|-------------------|

| SI.NO. | Description                                                                                                                                                              | Compliance status (YES/NO) | Operational model (specify : “In-house” or “Outsource”) | Remarks/Supporting Documents/Details Offered by Vendor                                                                  |
|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|---------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| 1      | Covered Fabrication shop floor with minimum Area 10mx6m for carrying out Fabrication of FBF activities                                                                   |                            |                                                         | Shop floor area                                                                                                         |
| 2      | Assembly Floor area of dimensions 6x3m with height of 6meteres.Floor area shall be dust free and smooth surface for assembly and testing operations.                     |                            |                                                         | Assembly floor dimension <ul style="list-style-type: none"> <li>• Length:</li> <li>• Width</li> <li>• Height</li> </ul> |
| 3      | EOT crane with minimum capacity of 10-ton, Vertical travel , vertical travel 6 meters, cross travel minimum 4 meters and speed 3m to 5m /min is required for operations. |                            |                                                         | <ul style="list-style-type: none"> <li>• Crane capacity</li> <li>• Vertical Travel</li> <li>• Cross Travel</li> </ul>   |

| Annexure-2 |             |                            |                                                         |                                                        |
|------------|-------------|----------------------------|---------------------------------------------------------|--------------------------------------------------------|
| SI.NO.     | Description | Compliance status (YES/NO) | Operational model (specify : “In-house” or “Outsource”) | Remarks/Supporting Documents/Details Offered by Vendor |

|          |                                                                                               |  |  |                                                                      |
|----------|-----------------------------------------------------------------------------------------------|--|--|----------------------------------------------------------------------|
| <b>1</b> | Capability in structural Fabrication of MS Structures                                         |  |  | Details of welded structure showing dimensional and welding details: |
| <b>2</b> | Availability of certified and experienced welders for welding Mild steel and SS304.           |  |  | No of AWS or ISO certified welders:                                  |
| <b>3</b> | Availability of Non Heating stress relieving equipment like Vibration Stress Reliving machine |  |  | Provide documentary proof                                            |

| <b>Annexure-3</b> |                                                                                                                                                                                                                                                                                                       |                                   |                                                                |                                                               |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|----------------------------------------------------------------|---------------------------------------------------------------|
| <b>Sl.NO.</b>     | <b>Description</b>                                                                                                                                                                                                                                                                                    | <b>Compliance status (YES/NO)</b> | <b>Operational model (specify : “In-house” or “Outsource”)</b> | <b>Remarks/Supporting Documents/Details Offered by Vendor</b> |
| <b>1</b>          | Availability of NDT inspection facilities for testing the welding defects and precision components                                                                                                                                                                                                    |                                   |                                                                | Provide documentary proof                                     |
| <b>2</b>          | Availability of Vibration Stress relieving system                                                                                                                                                                                                                                                     |                                   |                                                                | Provide documentary proof                                     |
| <b>3</b>          | Availability of inspection tools with calibration certificate <ul style="list-style-type: none"> <li>• Surface plate</li> <li>• Electronic Micrometer and Digital caliper</li> <li>• Feeler gauges</li> <li>• Digital dial gauges with 50 mm stroke</li> <li>• Thread plug and Ring gauges</li> </ul> |                                   |                                                                | Provide documentary proof                                     |

| Annexure-4 |                                                                                                                                                                            |                            |                                                         |                                                        |
|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|---------------------------------------------------------|--------------------------------------------------------|
| S.No       | Description                                                                                                                                                                | Compliance status (YES/NO) | Operational model (specify : “In-house” or “Outsource”) | Remarks/Supporting Documents/Details Offered by Vendor |
| 1          | Capability in executing precision Assembly and alignment jobs which includes linear motion guides, power screw, AC induction motor, Gear boxes, slewing ring bearings etc. |                            |                                                         | Provide documentary proof                              |

| Annexure-5 |                                                                                                      |                            |                                                         |                                                        |
|------------|------------------------------------------------------------------------------------------------------|----------------------------|---------------------------------------------------------|--------------------------------------------------------|
| Sl.NO.     | Description                                                                                          | Compliance status (YES/NO) | Operational model (specify : “In-house” or “Outsource”) | Remarks/Supporting Documents/Details Offered by Vendor |
| 1          | Capability of testing of welded structures of dimension 5mx2m using simulation mass minimum of 3 Ton |                            |                                                         | Provide documentary proof                              |

| Annexure-6 |             |                            |                                                         |                                                        |
|------------|-------------|----------------------------|---------------------------------------------------------|--------------------------------------------------------|
| S.No       | Description | Compliance status (YES/NO) | Operational model (specify : “In-house” or “Outsource”) | Remarks/Supporting Documents/Details Offered by Vendor |
|            |             |                            |                                                         |                                                        |

|          |                                                                                                                                |  |  |                                                                                                 |
|----------|--------------------------------------------------------------------------------------------------------------------------------|--|--|-------------------------------------------------------------------------------------------------|
| <b>1</b> | <b>Capability of Generation of Fabrication Drawings</b> in Siemens NX11 or higher version software following drawing standards |  |  | <ul style="list-style-type: none"> <li>• <b>Software:</b></li> <li>• <b>Version:</b></li> </ul> |
|----------|--------------------------------------------------------------------------------------------------------------------------------|--|--|-------------------------------------------------------------------------------------------------|

| <b>Annexure-7</b> |                                                                                                              |                                   |                                                                |                                                               |
|-------------------|--------------------------------------------------------------------------------------------------------------|-----------------------------------|----------------------------------------------------------------|---------------------------------------------------------------|
| <b>SI.NO.</b>     | <b>Description</b>                                                                                           | <b>Compliance status (YES/NO)</b> | <b>Operational model (specify : “In-house” or “Outsource”)</b> | <b>Remarks/Supporting Documents/Details Offered by Vendor</b> |
| <b>1</b>          | Material Testing as per NABL standards                                                                       |                                   |                                                                | <b>Provide documentary proof</b>                              |
| <b>2</b>          | Archival and Traceability of Raw materials from initial phase to final phase of fabrication                  |                                   |                                                                | <b>Provide documentary proof</b>                              |
| <b>3</b>          | Experience in Procurement of standard items likes linear motion guides, power screw, AC induction motors etc |                                   |                                                                | <b>Provide documentary proof</b>                              |

| <b>Annexure-8</b> |                                                                                                                                                                                                                                                                  |                                   |                                                                |                                                                                                                                                                                      |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SI.NO.</b>     | <b>Description</b>                                                                                                                                                                                                                                               | <b>Compliance status (YES/NO)</b> | <b>Operational model (specify : “In-house” or “Outsource”)</b> | <b>Remarks/Supporting Documents/Details Offered by Vendor</b>                                                                                                                        |
| <b>1</b>          | Availability of CNC machining facility (min 3axis) with minimum bed size of 4mx3m, with vertical travel of 1.6m <ul style="list-style-type: none"> <li>• CNC Milling Machine</li> <li>• CNC Turning machine</li> <li>• CNC Vertical machining centers</li> </ul> |                                   |                                                                | i. <b>Machine Model Number</b><br>ii. <b>Machine Make</b><br>iii. <b>Table Movement</b> <ul style="list-style-type: none"> <li>• X –axis travel</li> <li>• Y- axis travel</li> </ul> |

|          |                                                                                                                                                                                   |  |  |                                                                           |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|---------------------------------------------------------------------------|
| <b>2</b> | Availability of Heavy machineries <ul style="list-style-type: none"> <li>• Plano Milling machines</li> <li>• Vertical turret Lathes</li> <li>• Radial Drilling machine</li> </ul> |  |  | <ul style="list-style-type: none"> <li>• <b>Z- axis travel</b></li> </ul> |
| <b>3</b> | Capability in executing machining jobs with precise tolerance and surface finish.                                                                                                 |  |  | <b>Provide documentary proof</b>                                          |

| <b>Annexure-9</b> |                                                                                                                                            |                                   |                                                                |                                                               |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|----------------------------------------------------------------|---------------------------------------------------------------|
| <b>SI.NO.</b>     | <b>Description</b>                                                                                                                         | <b>Compliance status (YES/NO)</b> | <b>Operational model (specify : “In-house” or “Outsource”)</b> | <b>Remarks/Supporting Documents/Details Offered by Vendor</b> |
| <b>1</b>          | Capability in PLC programming and Integration of electrical components like MCB, VFD, HIM, relays, contacts , Limit switches, Sensors etc. |                                   |                                                                | <b>Provide documentary proof</b>                              |

**Note:**

- Provide Documentary Proof as supporting documents, topics where ever it is deemed necessary sheets can be attached
- Photographs/brochure/Catalogues of facilities, equipment may be provided as part of annexures
- Clearly fill the column with the regard to the availability of facilities in-house (OR) outsourcing.
- All these facilities will be visited and evaluated as part of technical evaluation process. Industries need to cooperate in showing their facilities, failing to which they would be disqualified.

