

# **Request for Proposal**

# Annual Maintenance Contract for Automated Antenna Positioning System of Near Field Test Range

# Space Applications Centre - Ahmedabad Indian Space Research Organisation

	Space Applications Centre	RFP
	Indian Space Research Organisation	Document
Para IPLO	Ahmedabad – 380015	Ver 1.4

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### **1. System Overview**

Near Field Test Range (NFTR) automated antenna positioning system consists of -

- 1. Simultaneously operated 4-axis inverted T-scanner with motion controller
- 2. Simultaneously operated 4-axis DUT positioner with motion controller
- 3. Automated test configuration and Data acquisition software

The SAC NFTR is operational for frequency range from 1.0 GHz to 40.0 GHz used for characterization of planar antenna systems.

The antenna positioning system of NFTR is having multi-axis, simultaneously operated, highly precise, heavy-duty positioners for accurate and precise characterization of antenna systems in near field by scanning in different formats viz. *Rectangular, Plane-polar, Bi-polar, Cylindrical* and *Spherical scans*.

The positioning system axis details are as per below -

- (i) <u>4-axis inverted T-Scanner</u> (Roll over Lin-Z over Lin-Y over Lin-X axis)
- (ii) <u>4-axis Device Under Test (DUT) Positioner</u> (Pol axis over Rot El axis over Rot Az axis over Lin. Slide axis)

This positioning system is used to support and position test devices, antennas, model towers, etc. for antenna measurements. Measurement software is required to configure the axis motion profiles for fully automated antenna measurement.



# 2. Antenna Positioning System to be included for AMC

### 2.1 Simultaneously operated 4-axis inverted T-scanner with motion controller

**2.1.1 4-axis inverted T-scanner** – T-Scanner is a standard 4-axis positioner having 3-linear axes and 1-rotational axis. The linear travel axes are X, Y, Z & rotational axis is Roll axis. T-Scanner makes possible the scanning of DUT antenna mounted over the DUT positioner in different configuration. It carries the probe antenna required for DUT characterization. The drive mechanism of the slide axes are rack and pinion type. The driving unit is a DC servomotor with sufficient performance rating in order to operate at the required loads, velocities and accelerations. Slide motion is accomplished by the gear-motor, to ensure the required torque for machine operations. The reduction worm gear drives a pinion connected to the reduction worm gear. The pinion is engaging with a rack gear, which is located between bearing rails. The rack and bearings rails are mounted on a positioner surface.



2.1.2 4-axis motion controller with Local Control Unit – T-Scanner motion controller is a standard 4-axis controller with built-in PCU. The front panel of controller enables manual operation by means of an operating axis selector, display axis selector, motor speed and direction control knob. A portable hand-held unit connected with motion controller through a cable and being used for controlling the motion of all independent axes in a sequential manner. Also indicates the axis limits in Forward (CW) / Reverse (CCW) direction. It incorporates a rotary switch for selecting one axis at a time.





### 2.2 Simultaneously operated 4-axis DUT positioner with motion controller

2.2.1 4-axis DUT positioner – DUT Positioner is a standard 4-axis positioner having 3-rotational axis and 1-linear slide axis. The rotational travel axes are Polarization, Elevation, Azimuth & Linear axis is DUT linear slide. DUT Positioner makes possible the measurement of antennas radiation characteristics of satellite, ground and various development models. The drive mechanism of DUT Positioner is very much similar to T-Scanner. The additional safety features offered by DUT Positioner are Tacho output from DC servomotors and electromechanical braking system in all rotational axis.



**2.2.2 4-axis motion controller** – DUT-Positioner motion controller is a standard 4-axis controller with built-in PCU. The front panel of controller enables manual operation by means of an operating axis selector, display axis selector, motor speed and direction control knob. A portable hand-held unit connected with motion controller through a cable and being used for controlling the motion of all independent axes in a sequential manner. Also indicates the axis limits in Forward (CW) / Reverse (CCW) direction. It incorporates a rotary switch for selecting one axis at a time.



### 2.3 Automated test configuration and Data acquisition software

The Automated test configuration and Data Acquisition (DAQ) software initializes, controls, configures the RF instruments and the positioning system. It defines the measurement configurations as per user requirement and performs the acquisition. It also has data processing and analysis module to process the raw measured data to compute the far field and near field characteristics of the AUT.



# **3. System Specifications**

### 3.1 Four (4) – axis inverted T-scanner System

**3.1.1 4-axis inverted T-scanner** – T-Scanner is a standard 4-axis positioner having 3-linear axes and 1-rotational axis.

Parameters		X-axis	Y-axis	Z-axis	<b>Roll-axis</b>
Travel Range		9.0 m	6.0 m	0.25 m	360 deg
Travel Load over axis		1750 kg	350 kg	60 kg	30 kg
Structure Material			Cast In	ron / Steel	
Valasity	min	250 mm/sec	250 mm/sec	12 mm/sec	5 deg/sec
velocity	max	500 mm/sec	500 mm/sec	20 mm/sec	12 deg/sec
Mechanical System	Planarity	< 0.12 mm RMS			
Motor Drive Power		3/4 hp	3/4 hp	1/3 hp	1/20 hp
Axis Accuracy RM	1S	0.07+X(m)/300	0.07+Y(m)/300	0.05+Z(m)/300	0.1deg
Repeatability		< 0.05 mm	< 0.05 mm	< 0.05 mm	<0.03 deg
Positioning Accuracy		< 0.1 mm	< 0.1 mm	< 0.1 mm	<0.06 deg
<b>Readout Resolution</b>		< 0.005 mm	< 0.005 mm	< 0.005 mm	<0.001 deg
<b>Operational movement</b> must be without jerking, no position hunting, and noise free smooth operational			smooth operation.		

*Table-01: Technical specifications related to T-Scanner* 

Table-02: Technical	specifications	related to T-Scanner	axis alignments
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Parameters	Unit	Specifications
Parallelism between T-scanner Roll axis and Z-axis	deg	$\pm 0.02$
Orthogonality between T-scanner Z-axis and Y-axis	deg	$\pm 0.02$
Orthogonality between T-scanner Y-axis and X-axis	deg	$\pm 0.02$

**3.1.2 4-axis T-scanner motion controller** – T-Scanner motion controller is a standard 4-axis controller with built-in PCU. The front panel of controller enables manual operation by means of an operating axis selector, display axis selector, motor speed and direction control knob. In the controller, the T-scanner axes are designated as:

Axis-01	X-axis
Axis-02	Y-axis
Axis-03	Z-axis
Axis-04	Roll-axis

Sr. No.	Description	Specification
01	No. of Axis to be controlled	All four axes as shown in 3.1.2
02	Axis Configurability	All the four axes are simultaneous / sequentially selectable as per user defined measurement configuration.

Table-03: 4-axis T-Scanner motion controller Specifications –



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Sr. No.	Description	Specification
03	Input Power Supply	Single Phase, 230 Volts AC 50 Hz ±10 % as per
		Indian standard
04	Motor Details of	DC servo Motors, Voltage Range: 80 – 115 Volt
	Axis-01, 02, 03 & 04	DC, Bi-directional
05	Encoder Details of Axis- 01, 02,	Relative encoder En-DAT Protocol
	03 & 04	
06	Software limit for all 04 axes	Available

Table-04: 4-axis T-Scanner	r motion controller	Front Panel S	pecifications -
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Sr. No.	Feature	Specifications
1	E-STOP	Latching Emergency Stop Panic-Switch opens the motor Armature
1	(Emergency Stop)	Common circuit.
2	Control and Display	Segmented LED Display resolution 0.001° (Angular) or 0.001mm
2	Window	(Linear), selectable as per axis.
3	Axis Selection	Axis-1 to Axis-4 is selected via multi position switch/knob as per
5	AXIS SELECTION	selected control axis
1	Limit Switch	LED indication when the active axis reaches the limit of the
4	Indicator	corresponding direction. CW (forward) or CCW (reverse)
5	Speed & Direction	Dual Function Knob/Potentiometer to provide manual velocity control
5	Control	for both Reverse or Forward direction control
6	Panel/Bus	Latching Illuminated Pushbutton Switch. Selects either computer
0	(local/remote) Select	control or front panel Control.
7	Power On/ Off	AC Input Power ON/OFF Illuminated when Unit is Power ON
/	Switch	AC input I ower Oly OTT. Intiminated when Onit is I ower Oly.
Compatible for (19")		Compatible for (19") standard rack maximum 4U chassis, Single Box
0	Dimensions	Solution

Table-05: 4-axis T-Scanner motion controller Rear Panel Interfaces Specifications –

Sr. No.	Feature	Type of Connector	
1	Axis-1		
2	Axis-2	MS3474W16-26S	
3	Axis-3	Nut Receptacle Panel Connector	
4	Axis-4		
5	Local Control Unit	MS3102E-20-29SW	
6	E-Stop	JMS 3476W10-6P	
7	Trigger Out	BNC (5V trigger pulse)	
8	Trigger In	BNC (5V trigger pulse)	
9	LAN/CAN	LAN or CAN for programming configuration as well as communication	
10	Power Point	3-pin Power point	
11	Interlocking	MS3470L10-6S	

**3.2 Four (4) – axis DUT Positioning System** 



**3.2.1 4-axis DUT Positioner** – DUT Positioner is a standard 4-axis positioner having 3-rotational axes and 1-linear axis.

Table-06: Technical specification related to DUT-Positioner

Parameter		Unit	Specifications
No of axis			04
Type of Positioner		Roll / Elevation / Azimuth + Linear Slide	
Delivered Torque	Polarization Axis	Kg-m	390
	Elevation Axis	Kg-m	1500
	Azimuth Axis	Kg-m	390
Withstand Torque (Max.	Polarization Axis	Kg-m	580
DUT weight 200 kg)	Elevation Axis	Kg-m	2250
	Azimuth Axis	Kg-m	580
Turntable Dia	meter	mm	625 mm
Drive Power	Polarization Axis	hp	3/4
	Elevation Axis	hp	3/4
	Azimuth Axis	hp	3/4
	Linear Slide Axis	hp	1/3
Maximum Speed	Polarization Axis	deg/sec	3.0 (0.5 rpm)
	Elevation Axis	deg/sec	0.33 (40°/min)
	Azimuth Axis	deg/sec	3.0 (0.5 rpm)
	Linear Slide Axis	mm/sec	125
Minimum Speed	Polarization Axis	deg/sec	0.05
_	Elevation Axis	deg/sec	0.05
	Azimuth Axis	deg/sec	0.05
	Linear Slide Axis	mm/sec	20
Position Accuracy	Polarization Axis	deg	0.03
	Elevation Axis	deg	0.03
	Azimuth Axis	deg	0.03
	Linear Slide Axis	mm	0.05
Repeatability	Polarization Axis	deg	0.02
	Elevation Axis	deg	0.02
	Azimuth Axis	deg	0.02
	Linear Slide Axis	mm	0.05
Travel Range	Polarization Axis	deg	360°
	Elevation Axis	deg	-25° to +92°
	Azimuth Axis	deg	±200°
	Linear Slide Axis	m	± 1.0
Vertical Load	Polarization Axis	kg	1000
	Azimuth Axis	kg	5000
	Linear Slide Axis	kg	2000
Bending Moment	El = 0 deg Axis	kg-m	1500

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Paramete	r	Unit	Specifications
	El = 980deg Axis	kg-m	2250
Maximum Backlash Polarization Axis		deg	0.05
	Elevation Axis	deg	0.05
Azimuth Axis		deg	0.05
Electromechanica	l Brakes		In all 03 axes
Encoder Type	Polarization Axis	Incremental encoders	
	<b>Elevation</b> Axis		
	Azimuth Axis		
	Linear Slide Axis		

Table-07: Technical s	pecifications	related to	DUT-Positioner	axis align	nments
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Parameters	Unit	Specifications
Parallelism of DUT Roll axis with T-scanner Z-axis	deg	$\pm 0.02$
Parallelism of DUT Azimuth axis with DUT Roll axis	deg	$\pm 0.02$
Orthogonality between DUT Linear slide axis and DUT azimuth axis	deg	$\pm 0.1$
Orthogonality between DUT Azimuth and DUT Elevation axis	deg	$\pm 0.1$
Orthogonality between DUT Elevation and DUT Roll axis	deg	$\pm 0.1$

**3.2.2 4-axis DUT Positioner motion controller** – DUT- Positioner motion controller is a standard 4-axis controller with built-in PCU. The front panel of the controller enables operation by means of an operating axis selector, display axis selector, motor speed and direction control knob. In the controller, the DUT Positioner axes are designated as:

Azimuth axis
Elevation axis
DUT Roll axis
DUT Linear Slide axis

Sr. No.	Description	Specification
01	No. of Axis to be controlled	All four axes as shown in 3.2.2
02	Axis Configurability	All the four axes are simultaneous / sequentially selectable as per user defined measurement configuration
03	Input Power Supply	Single Phase, 230 Volts AC 50 Hz $\pm 10$ % as per Indian standard
04	Motor Details of Axis-01, 02, 03 & 04	DC servo Motors, Voltage Range: 80 – 115 Volt DC, Bi-directional
05	Encoder Details of Axis-01, 02, 03, 04	Relative Encoders
06	Software limit for all 04 axis	Available
07	Electromechanical Braking for all 04 axis	Available

Table-08: 4-axis DUT-Positioner motion controller Specifications –

Sr. No.	Feature	Specifications
1	E-STOP	Latching Emergency Stop Panic-Switch opens the motor Armature
1	(Emergency Stop)	Common circuit.
2	Control and Display	Segmented LED Display resolution 0.001° (Angular) or 0.001mm
2	Window	(Linear), selectable as per axis.
3	Axis Selection	Axis-1 to Axis-4 is selected via multi position switch/knob as per
5	AXIS SELECTION	selected control axis
1	Limit Switch	LED indication when the active axis reaches the limit of the
4	Indicator	corresponding direction. CW (forward) or CCW (reverse)
5	Speed & Direction	Dual Function Knob/Potentiometer to provide manual velocity control
5	Control	for both Reverse or Forward direction control
6	Panel/Bus	Latching Illuminated Pushbutton Switch. Selects either computer
0	(local/remote) Select	control or front panel Control.
7	Power On/ Off	AC Input Power ON/OFF Illuminated when Unit is Power ON
/	Switch	AC input Fower ON/OFT. Inuminated when Onit is Fower ON.
8	Dimensions	Compatible for (19") standard rack maximum 4U chassis, Single Box
	Dimensions	Solution

Table-09: 4-axis DUT-Positioner motion controller Front Panel Specifications -

Table-10: 4-axis DUT-Positioner motion controller Rear Panel Interfaces Specifications -

Sr. No.	Feature	Type of Connector		
1	Axis-1			
2	Axis-2	MS3474W16-26S		
3	Axis-3	Nut Receptacle Panel Connector		
4	Axis-4			
5	Local Control Unit	MS3102E-20-29SW		
6	E-Stop	JMS 3476W10-6P		
7	Trigger Out	BNC (5V trigger pulse)		
8	Trigger In	BNC (5V trigger pulse)		
9	LAN/CAN	LAN or CAN for programming configuration as well as communication		
10	Power Point	3-pin Power point		
11	Interlocking	MS3470L10-6S		

### 3.3 Automated test configuration and Data acquisition software

The Automated test configuration and Data acquisition software is developed using low-level language.



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Sr. No.	Description	Specification		
		Data Acquisition Software has three modules namely:		
01	Number of	1. Data Acquisition Module		
01	Modules	2. Data Analysis Module		
		3. Data Presentation Module		
		Data Acquisition module has the following functions-		
02	Data Acquisition Module	<ol> <li>Data Acquisition module has the following functions-         <ol> <li>Automatic Scan setup, Computation and optimization of scan parameters.</li> <li>CW, List and Sweep frequency mode measurements.</li> <li>Amplitude and phase data acquisition.</li> <li>Continuous and step mode.</li> <li>Unidirectional &amp; Bidirectional mode.</li> <li>Switch, multiple-channels and multiple-beams control.</li> <li>Provision of Pause and Resume measurement control.</li> </ol> </li> <li>System Configuration save/recall – Saving of last System Configuration file generally contains- Project &amp; antenna details, frequencies, channel and/or beam definition, transmit power of RF &amp; LO sources, communication details (like IP address), positioner configuration details (free speed, scar speed, acceleration, deceleration etc.).</li> </ol> <li>Real time display – Amplitude and Phase raw data should be displayed or the screen (intensity plot) in real time to indicate the degree of completion It should display the scan, step axis range and current position, frequency quantity that is to be measured, file name etc. (the measurement definition summary).</li> <li>Parameters overview – Measurement Parameters overview for main parameters shall be displayed on screen for quick check of all se</li>		
03	Data Analysis Module	<ul> <li>Data Analysis/ processing module has the following Functions –         <ol> <li>Measured raw data files should include the following options– Transformation, Back-projection, Various systematic error correction</li> <li>X/Y/Φ radiation pattern cuts for co and cross polarisation for amplitud and phase.</li> <li>Co and Cross-radiation pattern, Gain, Directivity, Beam pointing.</li> <li>Beam peak, Beamwidth, Side lobes, Null depth with their location.</li> <li>Cross-polar level and Cross-polar isolation etc.</li> <li>Axial ratio (AR) and AR pattern.</li> <li>Phase centre position prediction from measured data.</li> <li>Normalization of data to value and peak.</li> </ol> </li> </ul>		



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Sr. No.	Description	Specification
		9. Data conversion and export to ASCII format / Excel format or TICRA compatible format (*.grd & *.cut).
04	Data Presentation Module	<ol> <li>Data Presentation module should have following functions –</li> <li>2D / 3D Plotting options.</li> <li>Cartesian, Intensity, polar, contour, 3D plotting features.</li> <li>Grey scale / Pseudo colour plotting.</li> <li>Flexible plot annotation feature.</li> <li>Markers / Pointers – Marker facility (minimum seven) on both sides of plots, Data cursor mode, Zooming, Panning, Cross-hair cursor etc.</li> <li>Data Import / Export options – Facility to export plots to *.jpeg, *.bmp, *.png, *.tiff etc. formats.</li> </ol>



# 4. Details of Parts/Components used in Positioning System

### 4.1 Drive Parts/Components list of 4-axis inverted T-Scanner -

Sr No.	Axis Details	Part	Detailed Specification
1.1	-	Motor	Permanent Magnet DC Servomotor, Type: M4-2952A- YY0Y3-225, Callan Technology Make, Tacho 7.0V 4.07Nm, 115 Vdc 11.3 Adc 3000 rpm
1.2		Encoder	FENAC Make, FNC 58B 10630V5000-R5, PPR – 5000 VCC – 5-30V dc, Sr No: 86909D21RDEA446, Turkish Made
1.3		Gear Box	DYNABOX EXPERT, Girard Transmissions Type: 75E3UCH2F, No: 1061000903001/01, (Lubricated by Mobil)
1.4	Linear X-axis	Limit Switch	Telemecanique XCE102C, IEC600947 – 5 – 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only
1.5		Homing Switch	Telemecanique XCE102C, IEC600947 – 5 – 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only
1.6		LM Guide ways	LM Hiwin Guideways & Blocks HR45
1.7		Rack & Pinion	Gudel Rack & Pinion Module 5
1.8		Panel Connector	MS3474W16-26S
1.9		Connector for end-1	MS3476W16-26P
1.10		Connector for end-2	MS3476W16-26P
2.1		Motor	Permanent Magnet DC Servomotor, Type: M4-2006D- YY001-142, Callan Technology Make, Sr No: 211129526, Tacho 7.0V 1.6Nm, 115 Vdc 2.8 Adc 2000 rpm
2.2		Encoder	BTH Incremental Rotary Encoder, Model: BI-38H8-2000- L5, Supply: 5V DC Line Driver 2000 PPR
2.3	Lincor	Gear Box	DYNABOX EXPERT, Girard Transmissions Type: 45E30CH2F, No: 106-1000603002/01 (Lubricated by Mobil)
2.4	Y-axis	Limit Switch	Telemecanique XCE102C, IEC600947 – 5 – 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only
2.5		Homing Switch	Telemecanique XCE102C, IEC600947 – 5 – 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only
2.6		LM Guide ways	LM Hiwin Guideways & Blocks HR45
2.7		Rack & Pinion	Gudel Rack & Pinion Module 5
2.8		Panel Connector	MS3474W16-26S



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Sr No.	Axis Details	Part	Detailed Specification
2.9		Connector for end-1	MS3476W16-26P
2.10		Connector for end-2	MS3476W16-26P
3.1		Motor	Permanent Magnet DC Servomotor, Type: M4-2006D- YY001-142, Sr No: 211129525, Tacho 7.0V 1.6Nm, 115 Vdc 2.8 Adc 2000 rpm, Callan Technology Make
3.2		Encoder	Autonics (Rotary Encoder), Model: E4056-2000-6-L-5 5V $dc \pm 5\%$ , Lot No. VG08R Made in Korea
3.3		Ball Screw	C3 Precession class Hardened and ground Pitch 5 mm & Diameter 30 mm
3.4	Linear Z-axis	Limit Switch	Telemecanique XCE102C, IEC600947 – 5 – 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only
3.5		Homing Switch	Telemecanique XCE102C, IEC600947 – 5 – 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only
3.6		LM Guide ways	LM Hiwin Guideways & Blocks HR45
3.7		Ball Screw	PMI 25 x 1000 mm
3.8		Panel Connector	MS3474W16-26S
3.9		Connector for end-1	MS3476W16-26P
3.10		Connector for end-2	MS3476W16-26P
4.1		Motor	Permanent Magnet DC Servomotor, Type: M4-2006D- YY001-142, Sr No: 211129527, Tacho 7.0V 1.6Nm 115 Vdc 2.8 Adc 2000 rpm, Callan Technology Make
4.2		Encoder	BTH Incremental Rotary Encoder, Model: BI-38H8-2000- L5, Supply: 5V DC Line Driver 2000 PPR
4.3		Gear Box	DYNABOX EXPERT, Girard Transmissions Type: 45E30CH2F, No: 106-1000903002/02 (Lubricated by Mobil)
4.4	Roll axis	Limit Switch	Telemecanique XCE102C, IEC600947 – 5 – 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only
4.5		Homing Switch	Telemecanique XCE102C, IEC600947 – 5 – 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only
4.6		Bearing	SKF make bearing SKF-01
4.7		Panel Connector	MS3474W16-26S
4.8		Connector for end-1	MS3476W16-26P
4.9		Connector for end-2	MS3476W16-26P
5.1		Grease For bearing	Kubler
5.2		Electrical panel wiring	Schneider



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Sr No.	Axis Details	Part	Detailed Specification
5.3		Timing Belts	Fenner make

### 4.2 Drive Parts/Components list of 4-axis T-Scanner motion controller -

Sr No.	Axis Details	Part	Detailed Specification
1.1		DC Servo Drive	100 volt 30 ampere, ADVANCED Motion Controls Part No. AB30A200I - X
1.2		SMPS	Siemens Make 50 Amp 90 volt DC Part No. 6EP1336- 1LD00
1.3	Linear X-	Remote IO	Selector Card 8-16 Beckhoff Make Part No. XB6cd226B
1.4	axis	Bias Control	Balluff Switch with relay (for Limits)
1.5		Remote IO	Remote I/o Beckhoff 40 input 24 output Part No. RIO- PM-00E (Ethercat Remote IO)
1.6		Panel Connector	Amphenol Make MS3474W16-26S
2.1		DC Servo Drive	100 volt 30 ampere, ADVANCED Motion Controls Part No. AB30A200I - X
2.2		SMPS	Siemens make 50 Amp 90 volt DC Part No. 6EP1336- 1LD00
2.3	Linear Y-	Remote IO	Selector Card 8-16 Beckhoff Make Part No. XB6cd226B
2.4	axis	Bias Control	Balluff Switch with relay (for Limits)
2.5		Remote IO	Remote I/o Beckhoff 40 input 24 output Part No. RIO- PM-00E (Ethercat Remote IO)
2.6		Panel Connector	Amphenol Make MS3474W16-26S
3.1		DC Servo Drive	100 volt 30 ampere, ADVANCED Motion Controls Part No. AB30A200I - X
3.2		SMPS	Siemens make 50 Amp 90 volt DC Part No. 6EP1336- 1LD00
3.3	Linear Z-	Remote IO	Selector Card 8-16 Beckhoff Make Part No. XB6cd226B
3.4	axis	Bias Control	Balluff Switch with relay (for Limits)
3.5		Remote IO	Remote I/o Beckhoff 40 input 24 output Part No. RIO- PM-00E (Ethercat Remote IO)
3.6		Panel Connector	Amphenol Make MS3474W16-26S
4.1		DC Servo Drive	100 volt 30 ampere, ADVANCED Motion Controls Part No. AB30A200I - X
4.2	Roll axis	SMPS	Siemens make 50 Amp 90 volt DC Part No. 6EP1336- 1LD00
4.3		Remote IO	Selector Card 8-16 Beckhoff Make Part No. XB6cd226B

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Sr No.	Axis Details	Part	Detailed Specification
4.4		Bias Control	Balluff Switch with relay (for Limits)
4.5		Remote IO	Remote I/o Beckhoff 40 input 24 output Part No. RIO- PM-00E (Ethercat Remote IO)
4.6		Panel Connector	Amphenol Make MS3474W16-26S
5.1		Linear Fast Switching DIO	Lenze Make, Fast Switching Module Part No. El21-24- 0010 Galvanic isolated
5.2		Remote IO	Beckhoff Make Part No. Ek1101-0090 Remote Bus Station ID-Switch
5.3		SMPS	Siemens Make Control Power Supply 24/12/5 V DC 10 Amp
5.4	Other	Siemens	Power Filter unit Meanwell for Trigger pulse
5.5	components	Relay Board	Brake unit for Servo motor Schneider Electric PM-01
5.6	of T-	Panel Connector	Amphenol MS3102E20-29SW (LCU Interface)
5.7	Scanner	Remote IO	Beckhoff Make (custom) Encoder Interface unit for E-bus
5.8	Motion	Remote IO	Tacho Feedback unit for 0-10 volt analog in El3xxx
5.9	Controller	Relay	Relay Card Siemens Make 220 volt / 5 Amp
5.10	Controller	Power Contactor	Schneider Make Part No. Sc10 Power Contactor
5.11		RTOS	Linx Make RT License for Motion controller
5.12		Driver File	DLL for Ethercat Bus to support various hardware (Custom made by OEM)
5.13		Push Buttons	Schneider Make standard
5.14		Potentiometer Knob	Takushi Make

### 4.3 Drive Parts/Components list of 4-axis DUT-Positioner -

Sr No.	Axis Details	Part	Detailed Specification
1.1		Motor	Permanent Magnet DC Servomotor, Type: M4-2952A- YY0Y3-225, Sr No: 211129531, Tacho 7.0V 4.07Nm 115 Vdc 11.3 Adc 3000 rpm, Callan Technology Make
1.2		Encoder	FENAC, FNC 58B 10630V5000-R5, PPR – 2000 VCC – 5-30V dc, Sr No: 86904L21AC015, Turkish Made
1.3	Azimuth axis	Gear Box	DYNABOX EXPERT, Girard Transmissions Type: 75M60CRU1, No: 1168123403/01 (Lubricated by Mobil)
1.4		Limit Switch	Telemecanique XCE102C, IEC600947 – 5 – 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15- 240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only
1.5		Homing Switch	Telemecanique XCE102C, IEC600947 – 5 – 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-



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Sr No.	Axis Details	Part	Detailed Specification
			240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity
1.5	-		only
1.6	-	Bearing	SKF make bearing SKF 816 dia
1.7	-	Panel Connector	MS3474W16-26S
1.8		Connector for end- 1	MS3476W16-26P
1.9		Connector for end- 2	MS3476W16-26P
1.10		Brake	Electromechanical Brakes, sure stop Matrix International
2.1		Motor	Permanent Magnet DC Servomotor, Type: M4-2952A- YY0Y3-225, Sr No: 211129532, Tacho 7.0V 4.07Nm 115 Vdc 11.3 Adc 3000 rpm, Callan Technology Make
2.2		Encoder	BTH Incremental Rotary Encoder, Model: BI-38H8-2000- L5, Supply: 5V DC Line Driver 2000 PPR
2.3		Gear Box	DYNABOX EXPERT, Girard Transmissions Type: 75M60CRU1, No: 1168123403/01 (Lubricated by Mobil)
2.4	Elevation axis	Limit Switch	Telemecanique XCE102C, IEC600947 – 5 – 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15- 240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only
2.5		Homing Switch	Telemecanique XCE102C, IEC600947 – 5 – 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15- 240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only
2.6		Bearing	SKF make bearing SKF 414 dia external teeth
2.7		Panel Connector	MS3474W16-26S
2.8		Connector for end- 1	MS3476W16-26P
2.9		Connector for end- 2	MS3476W16-26P
2.10		Brake	Electromechanical Brakes, sure stop Matrix International
3.1	Polarization axis	Motor	Permanent Magnet DC Servomotor, Type: M4-2952A- YY0Y3-225, Sr No: 211129529, Tacho 7.0V 4.07Nm 115 Vdc 11.3 Adc 3000 rpm, Callan Technology make
3.2		Encoder	FENAC, FNC 58B 10630V5000-R5, PPR – 2000 VCC – 5-30V dc, Sr No: 86904L21AC018, Turkish Made
3.3		Gear Box	DYNABOX EXPERT, Girard Transmissions Type: 90E90CH2F, No: 1061000068102/01, (Lubricated by Mobil)
3.4		Limit Switch	Telemecanique XCE102C, IEC600947 – 5 – 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-

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Sr No.	Axis Details	Part	Detailed Specification
			240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only
3.5		Homing Switch	Telemecanique XCE102C, IEC600947 – 5 – 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15- 240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only
3.6		Bearing	SKF make bearing SKF 544 dia internal teeth
3.7		Panel Connector	MS3474W16-26S
3.8		Connector for end- 1	MS3476W16-26P
3.9		Connector for end- 2	MS3476W16-26P
3.10		Brake	Electromechanical Brakes, sure stop Matrix International
4.1		Motor	Permanent Magnet DC Servomotor, Type: M4-2952A- YY0Y3-225, Sr No: 211129530, Tacho 7.0V 4.07Nm 115 Vdc 11.3 Adc 3000 rpm, Callan Technology make
4.2		Encoder	FENAC, FNC 58B 10630V5000-R5, PPR – 5000 VCC – 5-30V dc, Sr No: 86919J21NA450, Turkish Made
4.3		Gear Box	DYNABOX EXPERT, Girard Transmissions Type: 80E80CH1F, No: 1061000068101/01, (Lubricated by Mobil)
4.4	Linear Slide-axis	Limit Switch	Telemecanique XCE102C, IEC600947 – 5 – 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15- 240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only
4.5		Homing Switch	Telemecanique XCE102C, IEC600947 – 5 – 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15- 240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only
4.6		LM Guide ways	LM Hiwin Guideways & Blocks HR45
4.7		Ball Screw	PMI 25 x 1000 mm
4.8		Panel Connector	MS3474W16-26S
4.9		Connector for end- 1	MS3476W16-26P
4.10		Connector for end- 2	MS3476W16-26P
5.1		Grease For bearing	Kubler
5.2		Electrical wiring	Schneider
5.3		Timing Belts	Fenner make
5.4		Lubrication system	cenlub



### 4.4 Drive Parts/Components list of 4-axis DUT-Positioner motion controller -

Sr No.	Axis Details	Part	Detailed Specification
1.1		DC Servo Drive	100 volt 30 ampere, ADVANCED Motion Controls Part No. AB30A200I - X
1.2		SMPS	Siemens Make 50 Amp 90 volt DC Part No. 6EP1336- 1LD00
1.3	Azimuth	Remote IO	Selector Card 8-16 Beckhoff Make Part No. XB6cd226B
1.4	axis	<b>Bias Control</b>	Balluff Switch with relay (for Limits)
1.5		Remote IO	Remote I/o Beckhoff 40 input 24 output Part No. RIO- PM-00E (Ethercat Remote IO)
1.6		Panel Connector	Amphenol Make MS3474W16-26S
2.1		DC Servo Drive	100 volt 30 ampere, ADVANCED Motion Controls Part No. AB30A200I - X
2.2		SMPS	Siemens make 50 Amp 90 volt DC Part No. 6EP1336- 1LD00
2.3	Elevation	Remote IO	Selector Card 8-16 Beckhoff Make Part No. XB6cd226B
2.4	axis	Bias Control	Balluff Switch with relay (for Limits)
2.5		Remote IO	Remote I/o Beckhoff 40 input 24 output Part No. RIO- PM-00E (Ethercat Remote IO)
2.6		Panel Connector	Amphenol Make MS3474W16-26S
3.1		DC Servo Drive	100 volt 30 ampere, ADVANCED Motion Controls Part No. AB30A200I - X
3.2		SMPS	Siemens make 50 Amp 90 volt DC Part No. 6EP1336- 1LD00
3.3	Polarization	Remote IO	Selector Card 8-16 Beckhoff Make Part No. XB6cd226B
3.4	axis	Bias Control	Balluff Switch with relay (for Limits)
3.5		Remote IO	Remote I/o Beckhoff 40 input 24 output Part No. RIO- PM-00E (Ethercat Remote IO)
3.6		Panel Connector	Amphenol Make MS3474W16-26S
4.1	Linear Slide-axis	DC Servo Drive	100 volt 30 ampere, ADVANCED Motion Controls Part No. AB30A200I - X
4.2		SMPS	Siemens make 50 Amp 90 volt DC Part No. 6EP1336- 1LD00
4.3		Remote IO	Selector Card 8-16 Beckhoff Make Part No. XB6cd226B
4.4		Bias Control	Balluff Switch with relay (for Limits)
4.5		Remote IO	Remote I/o Beckhoff 40 input 24 output Part No. RIO- PM-00E (Ethercat Remote IO)
4.6	]	Panel Connector	Amphenol Make MS3474W16-26S

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Sr No.	Axis Details	Part	Detailed Specification	
5.1		Linear Fast Switching DIO	Lenze Make, Fast Switching Module Part 1 0010 Galvanic isolated	No. El21-24-
5.2		Remote IO	Beckhoff Make Part No. Ek1101-0090 Remot ID-Switch	e Bus Station

Amp

by OEM)

Tosoku Make

Schneider Make standard

SMPS

Siemens

Relay Board

Panel Connector

Remote IO

Remote IO

Relay

Power Contactor

RTOS

Driver File

**Push Buttons** Potentiometer

Knob

5.3

5.4

5.5

5.6

5.7

5.8

5.9

5.10

5.11

5.12

5.13

5.14

Other

components

of DUT-

Positioner

Motion

Controller

Siemens Make Control Power Supply 24/12/5 V DC 10

Beckhoff Make (custom) Encoder Interface unit for E-bus

DLL for Ethercat Bus to support various hardware (Custom made

Power Filter unit Meanwell for Trigger pulse

Relay Card Siemens Make 220 volt / 5 Amp

Linx Make RT License for Motion controller

Schneider Make Part No. Sc10 Power Contactor

Amphenol MS3102E20-29SW (LCU Interface)

Brake unit for Servo motor Schneider Electric PM-01

Tacho Feedback unit for 0-10 volt analog in El3xxx



# **5. Scope of Work**

Following is the scope of work, which includes need-based **PREVENTIVE MAINTENANCE**, **BREAKDOWN MAINTENANCE** & **CALIBRATION WORK** and **SPARE PARTS** delivery at NFTR/SAC. The response time for Preventive maintenance /Breakdown maintenance/ Calibration work shall be at most 72 hours (considering working days only) from the day of call or complaint.

### 5.1 PREVENTIVE MAINTENANCE – Need based

- A. Visual Inspection, exterior and interior cleaning, lubrication and adjustment/tuning of axis motion, if needed. Visual Inspection of the electrical and mechanical components, encoder and limit switch check, motors and gear box inspection, counterweight balancing and adjustments, positioners inspection and verifications for smooth operation, including speed test.
- B. Visual Inspection, exterior and interior of motion controller. Adjustment / Tuning of axis motion through optimizing the PID parameter in control software.
- C. Motion control verification for all 08 axes of 02 different positioners as per **FITP** (Functional Inspection Test Plan).
- D. Inspect painted and unpainted surface. If corrosion or damaged paint is discovered, then use steel brush/scotch to clean damaged paint and apply rich zinc epoxy paint 50-60 µm layer thickness and Jotun brand green top dual coat of 50 micron.
- E. System safe operation verification for all positioners.
- F. Inspection of system cabling and connectors.

Contractor has to provide the plan document related to preventive maintenance and servicing and should carry out the work in accordance to the same. Preventive maintenance work will involve checking and monitoring all the points as per the **FITP**. During the preventive maintenance schedule if any fault is find in positioning system then contractor should take the suitable steps to correct the trouble and bring the system in smooth functioning state.

- **5.2 BREAKDOWN MAINTENANCE** Breakdown maintenance work will involve trouble shooting of mechanical, electrical, electronic or any other system of the positioning system and solution of any other problem pointed out by SAC engineer, which inhibits the smooth operation and efficiency of the unit. Maintenance / Service engineers should come along with all the necessary tools and instruments in order to eliminate undue delay during the course of breakdown maintenance work.
  - A. Response time for failure analysis during AMC: After the complaint, the time between the arrival of the technical support personnel and proposal for remedial action shall not exceed 07 working days.
  - B. Repair time: The time between receipt of written proposal for remedial action and the ability to return the system to a working state shall be less than 14 working days excluding the time required to procure and supply the necessary part(s) at SAC.
  - C. Immediate online support (telephone, e-mail and internet) shall be provided when required.
  - D. Vendor should provide the price of all spare parts along with price validity of minimum 03 years with the offer in the prescribed format as given in Annexure-I.

- E. Vendor should have their efficient mechanism for arrangement and procurement of branded and genuine spares/components through reputed dealers/stockiest/distributors, available in the market. Responsibility to ensure and endorse the reliability, trueness and legality with regard to source and method of procurement and supply of said items is entirely rest on the Vendor and subject of Vendor. SAC will not be responsible by any way, interfere in any matter or have concern by any means, during said process of procurement, arrangement and supply. Furnishing the details and confirmation in writing in these regards must be attached by the Vendor along with the offer.
- F. Contractor will be called for breakdown maintenance visit at SAC and it is his responsibility to manage required spares to operationalize the positioners.
- G. Maintenance / services visit charges for above mentioned categories of maintenance under this contract should include; Lump sum amount for service / maintenance charges, to and fro travel charges, lodging, boarding, local conveyance and excess baggage.

### 5.3 Calibration Work – For calibration work

- A. Vendor will arrange all necessary calibration instrumentation.
- B. Vendor will arrange all necessary logistic support during calibration activity.
- C. Calibration activity of 02 different positioners will perform as per CTP (Calibration Test Plan).

### 5.4 Repair Work-

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- A. If any component of the positioner is repairable, in such case Contractor has to take prior approval from the SAC official to take the component to their premises for repairing.
- B. It is responsibility of Contractor to arrange the collection of defective items for repairing from SAC and safely return to SAC free of charge.
- C. After diagnosis, Contractor has to submit the quote and it has to be approved by SAC official.
- D. Once SAC official approves the quotation, Contractor may start repairing work of the same. After repair contractor has to give warranty of at least 6 months in any kind of repairs. If the same problem occurs within the warranty period, Contractor has to repair it on their own without any additional charges.
- E. Vendor has to furnish **bank guarantee** against the safety and security of the faulty component, which is to be collected and repaired at their premises by the vendor. The value of the said **bank guarantee** will be decided by SAC, based on cost of the component, which is to be repaired. The said **bank guarantee** will only be released after the receipt of the collected component in functional condition to SAC.
- **5.5 Supply of Spare Parts -** The spare parts / components required at the time of maintenance shall be provided by SAC if available in stock. In case the spare parts are to be replaced by contractor, the charges for the same shall be paid extra at actual by SAC.

Contractor must refer the list (Annexure-I) of spare parts / components for commercial offer valid till the end of contract and should agree in writing while giving quotation, for supplying all spares of system listed in Annexure-I.



However, contractor should add items/spares, which they feel necessary for the said breakdown maintenance work. Payment shall be made accordingly if spare parts / components are replaced from list of Annexure-I by Contractor from their stock during Breakdown / Preventive maintenance of the said system.

In case the spare parts / components are to be replaced which are not in the list of Annexure-I, the charges for the same shall be paid at actual by SAC. In addition, category in which the above-referred spare parts/component will fall, be decided by the SAC official. Contractor shall take prior approval from SAC Officials / Division Head / General Manager / Group Director in such case. After completion of maintenance / service work service person of the contractor has to demonstrate the positioners in working condition for breakdown maintenance work he has carried out against the particular breakdown calls and provide the maintenance / service report prepared by him.

In general, following are two categories of spares (as indicated in the List of Annexure-I) may be needed during Preventive, repair and Breakdown maintenance work of the machines:

- **Minor**/ wear & tear or consumable spares: Spares of this category should be arranged in two to three days (excluding Sundays & public holidays) beyond this time limit it should be considered to be delayed delivery of items.
- **Major**/ breakdown Spares: Spares of this category should be arranged in ten to twelve days (excluding Sundays & public holidays) beyond this time limit it should be considered delayed delivery of items.

However, reasons for delay and non-availability of the spares and its genuineness of the situation will be reviewed by SAC official in order to rationalize the above said terms, case to case. However, decision in this regard shall entirely under discretion of SAC official and final, Vendor should abide to the same.

**5.6** After completion of maintenance/service/repair work service person of the contractor has to demonstrate the positioner in full working condition and provide the maintenance/service report prepaid by him. However, please note that if subsequent to above work, calibration work is felt needed then the vendor should carry out calibration work to validate the positioning system.

Following table have the detailed scope of work related to every activity to finish the breakdown maintenance, preventive maintenance, repair maintenance and calibration of DUT Positioner and T - Scanners installed at NFTR/SAC.

Sr. No.	Type of work	Frequency	Quantum of work/ Scope of work
1	Breakdown Service visit	as and when required	Service includes: fault diagnosis, functional inspection, dismantling, part replacement, tuning of motion, motion verification, assembly and final test
2			Service includes functional inspection



Sr. No.	Type of work	Frequency	Quantum of work/ Scope of work
	Calibration visit	Once in a year or as and when required	Laser alignment activity includes instrument and technical support staff Tuning of motion if required
3	Preventive maintenance visit	Max. Four times in year as and when required	Service includes: functional inspection, cleaning of mechanical parts, greasing and oiling, verification of electrical and control wiring, change the oil seals, Complete visual inspection of positioner, full motion verification with full load and no load condition
4	Spare Parts	as and when required	Identify the spare requirement, procurement and supply of the same to SAC
5	Logistic Support	as and when required	Decide the suitable equipment and arrange the same at SAC.

**Promptness for respond:** Contractor will have to attend the breakdown calls within **72 hours** after receipt of the calls through telephone / e-mail / fax, excluding the day of communication from SAC officials.

**Prior approval:** Contractor will have to inform & take prior approval from the SAC official regarding the names with mobile number or other personal required details of visiting service engineers and details of items carrying by them into the SAC campus.



### 6. Payment Terms:

#### 6.1 Payment of Visit Charges for Breakdown / Preventive / Calibration / Repair work -

Payment will be made on successful completion of each Preventive work and for Calibration /Breakdown /Repair work; it will be paid after successful completion, testing and validation activities. The invoice in duplicate duly certified by the user and approved by Dy. Head/Head of the Division along with Job Completion Voucher (JCV), to the effect that the positioner / system is maintained / serviced satisfactorily, shall be submitted to Accounts Officer, Bills, SAC for releasing payment. Since this is a maintenance service contract no MIRVs will be issued for payment of service charges but End User has to provide satisfactory Job Completion Voucher (JCV) with contractor's invoice to Accounts with the approval of Dy. Head/Head of the Division.

#### 6.2 Payment for Supply of Spares and Consumables -

Spares / components / consumables to be required at the time of servicing / maintenance of the positioner, shall be replaced with prior approval from the SAC Engineer / Division Head/ Group Director. Payment will be made based on original invoice along with the end user certificate duly approved by Head of the Division, that the charges of the spares are reasonable. The worn out / retrieved parts shall be SAC property.

#### 6.3 Payment for Repairing of Positioner Components at Contractors Premises -

Contractor may take defective positioner components, electronics cards, motors, timers, drive and other items fitted in the Positioner to their premises after prior approval from concerned SAC Engineer / Division Head/ Group Director for repairing and charges for the same will be paid extra by SAC. Contractor would submit the estimated repair charges indicating warranty of such repaired/new parts replaced during repairing before starting the repairing work of such parts. Payment will be made after assembly of the repaired parts/spares with the positioner and demonstration of positioner in full working condition. Submission of invoices along with the end user certificate duly approved by Head of the Division that the repairing charges are reasonable is necessary.

It is responsibility of Contractor to arrange the collection of defective items for repairing from SAC and safely return to SAC free of charge.

**6.4 Penalty** of Rupees 5% of total visit charges per visit shall be deducted in case of delay in response by the contractor beyond 72 hours, excluding the day of communication from SAC officials, seeking the service engineer visit to SAC Ahmadabad. If the total delay in response is beyond Five days from date of communication, penalty of 10% of the visit charges shall be deducted for relevant visit for that particular complaint.

Penalty of Rupees 5% of basic cost of the spare shall be deducted in case of delay in delivery beyond the specified time limit as categorized in section 3.5 & tabulated in Annexure-I.

Penalty of Rupees 10% of visit charges shall be deducted in case of event, where contractor is not able to offer the system in full operational condition within 14 days from the receipt of written proposal for remedial action. This 14 days duration, will include repairing work at vendors facility/factory and testing

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& validation time at SAC but excluding the time required to procure and supply the necessary part(s) at SAC.

However, reasons for delay, non- availability of service engineer/spare for maintenance/repair service and genuineness of the situation for such delay, will be reviewed by SAC officials in order to rationalize the above said terms, case to case. However, decision in this regard shall entirely under discretion of SAC officials and final, Contractor should abide by the same.

# 7. Duration of the Contract:

The contract will be awarded for a period of <u>36 months</u> from the date of the contract. The contract may be extended for <u>further 12 months with last same rates based on satisfactory services</u> of the Contractor and on mutual consent of both the parties, with same rates and terms and conditions. However, there is no guarantee of any extension or renewal of the contract after expiry of the initial 36 months.

- **7.1 Monitoring of Contract** SAC reserves the right to review and verify the progress of work at various stages / any time during the positioner maintenance work and adherence by the Contractor to the standards and procedures specified.
- **7.2 Termination of Contract** SAC reserves the right to terminate the contract if the performance / services of the contractor is not found satisfactory during the period of the contract, by giving one-month notice in writing without any financial implications on either side. SAC reserves the right to enter into parallel contract simultaneously or at any point of time during the period of the said contract with one or more contractors.

# 8. General Terms & Conditions:

- 1. Contractor must have suitable facilities like maintenance and calibration kit specifically required for repairing the positioner and must possess all the equipment / tools required at the time of breakdown / preventive maintenance work to be carried-out at SAC for the above positioner.
- 2. Contractor must have suitable workforce having expertise in Linux and C/C++, to update or modify the PID parameters through the programming software. Contractor can also collaborate with  $3^{rd}$  part having expertise in Linux and C/C++ based motion controller programming.
- 3. The Contractor's personnel will not be allowed entry into any building or laboratory in SAC other than those specified.
- 4. The personnel deployed should follow the general guidelines/ rules and work practices of the SAC while working at facility. He should also maintain the office discipline/ decorum during the duty hours at SAC.
- 5. However, along with the offer, contractor should communicate the name of the authorized person and the name of the service persons along with full communication details like; land line numbers of the office, mobile numbers of the said persons, e-mails and any other communication channel established by the company in order to make efficient communication.
- 6. The contractor shall be responsible to ensure the credentials of individuals deputed on job under the contract from the security point of view.
- 7. Vendor has to provide point-by-point compliance as per Annexure-IV.
- 8. The contract will be valid for a period of three years from the date of issuing the purchase order and can be further extended for maximum upto 01 year from the date of expiry of the current contract.
- 9. Vendor should deploy competent work force to execute such contract including graduate engineers having degree in Mechanical, Electrical or Mechatronics branch. Any loss, damage or breakage of the system or any loss to the SAC property, directly or indirectly linked to the mishandling or lack of knowledge by the vendor during the preventive maintenance or breakdown call shall be recovered from the vendor.
- 10. The vendor shall arrange all the required materials including cotton cloth, grease, oil, tools, forklift, crane etc. for carrying out preventive maintenance and attending breakdown calls.
- 11. Vendor shall carry out maintenance work on a mutually agreed time slot in every quarter.
- 12. The Vendor shall have to maintain a logbook recording details of the servicing work carried at SAC including replacement of parts, if any and fill the preventive maintenance checklist as specified in Table of Annexure-II.
- 13. Vendor shall be responsible to maintain the positioning system in good working condition.
- 14. In case spare part/s is/are not available with SAC, the same will be procured by the Vendor to make the system in working condition. SAC will reimburse cost of such spare part supplied by the Vendor against the bill. The requirements of part/s with cost is to be intimated in advance to SAC and the Vendor should obtain written concurrence before procuring the parts.
- 15. Only new components are to be supplied as and when required.
- 16. L1 will be decided based on the overall quoted prices of Preventive maintenance, Calibration and Breakdown. Vendor shall quote separately for AMC and components/parts as per Annexure-I in defined format for price bid.
- 17. Material handling equipment like Cranes, Forklift truck, etc. has to be arranged by the vendor as and when require.



- 18. Hydra operator must have accompanied with trained rigger.
- 19. Vendor should carry valid RTO documents for Hydra and other automobile mounted lifting equipment.
- 20. Form 10 with dates of validity, ensuring safety inspection of equipment including detail report of inspection carried out at the time of issuance of Form 10.
- 21. Driving license and training validity certificate of Hydra operator.
- 22. SAC will not be responsible for injury to vendor's personnel during material handling, dis-assembly, assembly or any other work.
- 23. Utmost care should be taken by your service persons while carrying out the job and ensure the safety of neighbouring instrument or whatsoever of SAC property.
- 24. Generally, the maintenance work will be carried out during normal working days (i.e. Monday to Friday) between 9.30 to 18.00 hours, unless otherwise mutually agreed upon to some other time schedule.
- 25. **INTELLECTUAL PROPERTY RIGHTS & CONFIDENTIALITY:** The Contractor shall not use technical information, reports and other related documents given by SAC during the course of his work for any purpose other than for carrying out the work under Contract to be finalized under this RFP.
- 26. **COVERAGE / RISK OF THE DEPLOYED SERVICE PERSONS:** Contractor is fully responsible for the safety of his service persons deployed at SAC. The contractor will be entirely held responsible in case of any accident, which leads to minor or major physical injury and loss of life of his personnel during the time of execution of contract at our premises due to natural calamities / accident explosion etc. if any.
- 27. SAC is not responsible for any kind of accident to the persons deployed by contractor and no provision has been made to provide any financial assistance / any kind of compensation or cost incurred in connection with such kind of incidence.
- 28. **SECURITY:** Contractor shall produce the identity certificate / card which reveals the details like name of the personnel deployed, his date of birth, etc. with duly signed by the person deployed for the work. However, contractor should be ready for any other formalities, which may be required by competent authority of the SAC at the time of finalization of contract and it should be complied.
- 29. **ARBITRATION:** Dispute, if any, shall be settled mutually, failing which it shall be referred to a oneman Arbitrator appointed by the Director, SAC Ahmedabad in accordance with Arbitration Act 1996, whose decision shall be final and binding on both the parties.
- 30. **FALL CLAUSE:** The rates charged by the vendor for the work, shall in no event exceed the lowest rates charged for the work of identical description, to any other party during the validity of the agreed rates. If, at any time during the said period, the Vendor reduces the rates for the work to any other party, he shall forthwith notify such reduction of rates applicable to the undersigned and the rates payable under this contract for the work shall stand correspondingly reduced.

# Vendor must perform functional inspection in presence of NFTR engineer and submit the inspection report duly signed by facility In-charge/engineer in the form of printed hard copy



### **Annexure-I: Price Bid Format**

Sr. No	Type of work	Frequency	Quantum of work/ Scope of work	Unit Price valid up to 3 Years	<u>Remarks</u>
1	Breakdown Service visit	as and when require	Service charges per day (including required person for fault diagnosis, functional inspection, dismantling, part replacement, tuning of motion, motion verification, assembly and final test) (Definition of unit = per days)		Definition of Unit Price: per day Though it is per day, the no. of days that will be consumed for breakdown service, will be decided jointly by SAC and Vendor
2	Calibration visit	Max. Once in a year (as and when require)	Service charges includes functional inspection laser alignment activity charges includes instrument and support staff tuning of motion charges if required		Definition of Unit Price: per visit Service charges for calibration visit for two days will be quoted as a lump sum price and will be considered as a unit price for that activity
3	Preventive maintenance visit	Need based (minimum 02 days per visit)	Service charges for two days (including required person for functional inspection, tuning of motion, cleaning of mechanical parts, greasing and oiling, verification of electrical and control wiring, change the oil seals, timing belt tension verification, Complete visual inspection of positioner, full motion verification with and without load)		Definition of Unit <u>Price: per visit</u> Service charges for preventive maintenance visit for two days will be quoted as a lump sum price and will be considered as a unit price for that activity.
4	Logistic Support	as and when require	Crane with operator 12 – 14 Ton Capacity Forklift with 2 Ton Load Capacity Forklift with 5 Ton Load Capacity Forklift with 10 Ton Load Capacity Lifting Tripod upto 1000 Kg load capacity with Laborer Shifting of any part to vendor premises (without FIM) – required truck upto 25 feet – open		Definition of Unit price: 24 hours from Logistic support availability at NFTR/SAC



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#### Spare Part List –

Sr No.	Devices	Detailed specification	Unit Price valid up to 3 Years	Spare/item category
1	Motor	Callan Make Permanent Magnet DC Servomotor, Type: M4-2952A-YY0Y3-225 with Tacho		Major
2	Motor	Callan Make Permanent Magnet DC Servomotor Type: M4-2006D-YY001-142 with Tacho		Major
3	Encoder	FENAC Make FNC 58B 10630V5000-R5, PPR – 5000		Major
4	Encoder	BTH Make Incremental Rotary Encoder Model: BI-38H8-2000-L5		Major
5	Encoder	Autonics Make Rotary Incremental Encoder Model: E4056-2000-6-L-5		Major
6	Gear box	DYNABOX EXPERT Make Girard Transmissions Type: 75E3UCH2F		Major
7	Gear box	DYNABOX EXPERT Make Girard Transmissions Type: 45E30CH2F		Major
8	Gear box	DYNABOX EXPERT Make Girard Transmissions Type: 75M60CRU1		Major
9	Gear box	DYNABOX EXPERT Make Girard Transmissions Type: 90E90CH2F		Major
10	Gear box	DYNABOX EXPERT Make Girard Transmissions Type: 80E80CH1F		Major
11	DC Servo Drive	100 volt 30 Amp ADVANCED Motion Controls Part No. AB30A200I - X		Major
12	Remote IO	Selector Card 8-16 Beckhoff Make Part No. XB6cd226B		Major
13	Remote IO	Remote I/o Beckhoff 40 input 24 output Part No. RIO-PM-00E (Ethercat Remote IO)		Major
14	Linear Fast Switching DIO	Lenze Make Fast Switching Module Part No. El21-24-0010 Galvanic isolated		Major
15	Remote IO	Beckhoff Make Part No. Ek1101-0090 Remote Bus Station ID-Switch		Major
16	Relay Board	Brake unit for Servo motor Schneider Electric PM-01		Major



Sr No.	Devices	Detailed specification	Unit Price valid up to 3 Years	Spare/item category
17	Remote IO	Beckhoff Make (custom) Encoder Interface unit for E-bus		Major
18	Remote IO	Tacho Feedback unit for 0-10 volt analog in El3xxx		Major
19	RTOS	Linx Make RT License for Motion controller		Major
20	Driver File	DLL for Ethercat Bus to support various hardware (Custom made by OEM)		Major
21	Limit Switch	Telemecanique Make XCE102C, IEC600947 – 5 – 1, Same Polarity only		Minor
22	Homing Switch	Telemecanique XCE102C, IEC600947 – 5 – 1, Same Polarity only		Minor
23	Panel connector	Amphenol Aero MS3474W16-26S		Minor
24	Connector for end-1	Amphenol Aero MS3476W16-26P		Minor
25	Connector for end-2	Amphenol Aero MS3476W16-26P		Minor
26	Ball Screw	C3 Precision Make ground Pitch 5mm & Diameter 30 mm		Minor
27	SMPS	Siemens Make 50 Amp 90 volt DC Part No. 6EP1336-1LD00		Minor
28	Bias Control	Balluff Switch with relay (for Limits)		Minor
29	Panel Connector	Amphenol Make MS3474W16-26S		Minor
30	SMPS	Siemens Make Control Power Supply 24/12/5 V DC 10 Amp		Minor
31	Siemens	Power Filter unit Meanwell for Trigger pulse		Minor
32	Panel Connector	Amphenol Aero MS3102E20-29SW (LCU Interface)		Minor
33	Relay	Relay Card Siemens Make 220 volt / 5 Amp		Minor
34	Power Contactor	Schneider Make Part No. Sc10 Power Contactor		Minor
35	Push Buttons	Schneider Make standard		Minor
36	Potentiometer Knob	Takushi Make		Minor
37	LM Guideways			Minor
38	Rack & Pinion			Minor
39	Slewing Bearing			Minor

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Sr No.	Devices	Detailed specification Valid up to 3	Spare/item category

Minor

Ball Screw

40



# **Annexure-II: Preventive Maintenance Checklist**

FITP (Functional Inspection Test Plan)

Format for functional inspection report (to be submitted in every quarter)

Sr No	Positioner and Axis	Parameters	Status	Remarks
1		Visual inspection of DUT Positioner		
2	DUT	Check Timing belt tension of all axes and adjust if		
	Positioner	Check control cable connections. Clean and secure		
3		connectors and cables.		
4	DUT	Visual inspection of DUT Positioner Controller		
5	DUI	Check exterior and interior of motion controller.		
6	Controller	Adjustment / Tuning of axis motion through		
7		Verification of movement in forward direction		
8		Verification of movement in reverse direction		
		Limit to limit movement of linear slide in both		
9	DUT – Linear	direction		
10	Slide Axis	Movement verification with fine speed selection		
11		Movement verification with Coarse speed selection		
12		Greasing of Rack & Pinion and Lm Guides		
13		Oiling of Reduction Gear Boxes		
14		Verification of movement in forward (+) direction		
15		Verification of movement in reverse (-) direction		
16		Limit to limit movement of azimuth axis rotation in both direction		
17	DUT –	Movement verification with fine speed selection		
18	Azimuth Axis	Movement verification with Coarse speed selection		
19		Functional Verification of Electromechanical brakes		
20		Greasing of Slewing Bearing		
21		Oiling of Reduction Gear Boxes		
22		Verification of movement in forward (+) direction		
23		Verification of movement in reverse (-) direction		
24	דיות	Limit to limit movement of elevation axis rotation in both direction		
25	Elevation	Movement verification with fine speed selection		
26	Axis	Movement verification with Coarse speed selection		
27		Functional Verification of Electromechanical		
21		brakes		
28		Greasing of Slewing Bearing		

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29		Oiling of Reduction Gear Boxes	
30		Verification of movement in forward (CW)	
		direction	
31		Verification of movement in reverse (CCW)	
		direction	
32	DUT –	Limit to limit movement of polarization axis	
33	Polarization	Movement verification with fine speed selection	
34	Axis	Movement verification with Coarse speed selection	
54		Functional Verification of Electromechanical	
35		brakes	
36		Greasing of Slewing Bearing	
37		Oiling of Reduction Gear Boxes	
38		Visual inspection of FEED Positioner	
20		Check Timing belt tension of all axes and adjust if	
39	T-Scanner	required	
40		Check control cable connections. Clean and secure	
40		connectors and cables.	
41	T-Scanner	Visual inspection of T-Scanner Controller	
42	Controller	Check exterior and interior of motion controller.	
43		Adjustment / Tuning of axis motion through	
4.4		optimizing the PID parameter in control software	
44		Verification of movement in forward (+) direction	
45		Verification of movement in reverse (-) direction	
46	T-Scanner	Limit to limit movement of linear slide axis in both	
17	– Linear Slide	Movement verification with fine speed selection	
47	X-axis	Movement verification with Coarse speed selection	
48		Greasing of Linear Bearings/ Lm Guides	
49		Greasing of Rack & Pinion	
50		Verification of movement in forward (+) direction	
51		Verification of movement in reverse (-) direction	
50	тс	Limit to limit movement of linear slide axis in both	
52	T-Scanner	direction	
53	- Linear Since	Movement verification with fine speed selection	
54	1 -ax18	Movement verification with Coarse speed selection	
55		Greasing of Linear Bearings/ Lm Guides	
56		Greasing of Rack & Pinion	
57		Verification of movement in forward (+) direction	
58	T-Scanner	Verification of movement in reverse (-) direction	
59	– Linear Slide	Limit to limit movement of azimuth axis rotation in	
	Z-axis	both direction	
60		Movement verification with fine speed selection	
61		Movement verification with Coarse speed selection	

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62		Greasing of Slewing Bearing	
63		Oiling of Reduction Gear Boxes	
64		Verification of movement in forward (CW) direction	
65		Verification of movement in reverse (CCW) direction	
66	T-Scanner – Roll axis	Limit to limit movement of polarization axis rotation in both direction	
67		Movement verification with fine speed selection	
68		Movement verification with Coarse speed selection	
69		Greasing of Slewing Bearing	
70		Oiling of Reduction Gear Boxes	
Any Spo relate Any Spo related	ecific remark ed to DUT sitioner ecific remark to T-Scanner		
<b>unction</b>	al Inspection P	erformed by:	i
Remarks	by NFTR - SA	C Engineer:	
SAC Eng	ineer Present I	During Functional Inspection:	

Remarks by NFTR Incharge: \_\_\_\_\_

NFTR Incharge Signature: \_\_\_\_\_


# **Annexure-III: Calibration Test Plan**

CTP (Calibration Test Plan)

Format for Calibration inspection report (to be submitted in every year)

Sr No.	Description		Units	Required Results	Measured Results
1			<b>Travel Direction</b>	Test	
	Linear X-Slide axis	FWD		OK	
		REV		OK	
	Linear Y-Slide axis	FWD		OK	
		REV		OK	
	Linear Z- Slide axis	FWD		OK	
		REV		OK	
	Roll axis	FWD		OK	
		REV		OK	
2			Limit to Limit T	avel	
	Linear X-Slide a	ixis	mm	+4500	
	(including homing @	center)	mm	-4500	
	Linear Y-Slide a	ixis	mm	+3000	
	(including homing @	center)	mm	-3000	
	Linear Z-Slide a	xis	mm	-125	
	(including homing @	center)	mm	+125	
	Roll axis		deg	360	
3			Safe Operate Swite	h Test	
	SAFE/OPERATE S	Switch		OK	
	EMERGENCY S	Stop		OK	
4			Repeatability T	est	
	Linear X-Slide a	ixis	mm	Less than 0.05	
	Linear Y-Slide a	ixis	mm	Less than 0.05	
	Linear Z-Slide a	xis	mm	Less than 0.05	
	Roll axis		deg	Less than 0.05	
5			Positioning Accu	racy	
	Linear X-Slide a	ixis	mm	Less than 0.1	
	Linear Y-Slide a	ixis	mm	Less than 0.1	
	Linear Z-Slide a	xis	mm	Less than 0.1	
	Roll axis		deg	Less than 0.1	
6	Overall Planar	ity	Less than 0.12 m	m over the full 9	m x 6 m Rectangular
				scan grid	

Parameters	Unit	Required	<b>Measured Results</b>
		Results	

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Paralle	lism between T-scanner	Roll axis ar	nd Z-axis	deg	$\pm 0.02$		
Orthog	onality between T-scann	er Z-axis a	nd Y-axis	deg	$\pm 0.02$		
Orthog	onality between T-scann	er Y-axis a	nd X-axis	deg	$\pm 0.02$		
Sr	Description		Units		Required	Measur	ed Results
No.					Results		
1			Travel I	Direction	n Test	1	
	Lower Linear Slide	FWD			OK		
	axis	REV			OK		
	Azimuth axis	FWD			OK		
		REV			OK		
	Elevation axis	FWD			OK		
		REV			OK		
	Roll axis	FWD			OK		
		REV			OK		
2			Limit to	Limit 7	Travel	-	
	Lower Linear Slide	e axis	mm		+1000		
	(including homing @	center)	mm		-1000		
	Azimuth axis (includin	g homing	deg		+182		
	@ pre-defined pos	ition)	deg		-182		
	Elevation axis (incl	luding	deg		-25		
	homing @ pre-defined	position)	deg		+92		
	Roll axis		Deg		360		
3			Safe Oper	ate Swit	tch Test	-	
	SAFE/OPERATE S	Switch			OK		
	EMERGENCY S	Stop			OK		
4			Repea	tability '	Test		
	Linear X-Slide a	axis	mm		Less than 0.03		
	Azimuth axis		deg		Less than 0.02		
	Elevation axis	5	deg		Less than 0.02		
	Roll axis		deg		Less than 0.02		
5			Position	ing Acc	uracy		
	Linear X-Slide a	axis	mm		Less than 0.05		
	Azimuth axis		deg		Less than 0.03		
	Elevation axis	5	deg		Less than 0.03		
	Roll axis		deg		Less than 0.03		

Parameters	Unit	Required	<b>Measured Results</b>
		Results	
Parallelism of DUT Roll axis with T-scanner Z-axis	deg	$\pm 0.02$	
Parallelism of DUT Azimuth axis with DUT Roll axis	deg	$\pm 0.02$	
Orthogonality between DUT Linear slide axis and DUT	deg	$\pm 0.1$	
azimuth axis			



Orthogonality between DUT Azimuth and DUT	deg	$\pm 0.1$	
Elevation axis			
Orthogonality between DUT Elevation and DUT Roll	deg	$\pm 0.1$	
axis			

Sr No	Positioner and Axis	Parameters	Status	Remarks
1		Visual inspection of DUT Positioner		
2	DUT Positioner	Check Timing belt tension of all axes and adjust if required		
3	1 Ostroner	Check control cable connections. Clean and secure connectors and cables.		
4	DUT	Visual inspection of DUT Positioner Controller		
5	Positioner	Check exterior and interior of motion controller.		
6	Controller	Adjustment / Tuning of axis motion through optimizing the PID parameter in control software		
7		Verification of movement in forward direction		
8		Verification of movement in reverse direction		
9		Limit to limit movement of linear slide in both direction		
10	DUI – Linear	Movement verification with fine speed selection		
11	Silue Axis	Movement verification with Coarse speed selection		
12		Greasing of Rack & Pinion and Lm Guides		
13		Oiling of Reduction Gear Boxes		
14		Verification of movement in forward (+) direction		
15		Verification of movement in reverse (-) direction		
16		Limit to limit movement of azimuth axis rotation in both direction		
17		Movement verification with fine speed selection		
18	DUT – Azimuth Axis	Movement verification with Coarse speed selection		
19		Functional Verification of Electromechanical brakes		
20		Greasing of Slewing Bearing		
21		Oiling of Reduction Gear Boxes		
22		Verification of movement in forward (+) direction		
23		Verification of movement in reverse (-) direction		
24	DUT –	Limit to limit movement of elevation axis rotation in both direction		
25	Elevation	Movement verification with fine speed selection		
26	Axis	Movement verification with Coarse speed selection		
27		Functional Verification of Electromechanical brakes		

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28		Greasing of Slewing Bearing	
20		Oiling of Reduction Gear Boxes	
27		Verification of movement in forward (CW)	
30		direction	
21		Verification of movement in reverse (CCW)	
31		direction	
22		Limit to limit movement of polarization axis	
52	DUT –	rotation in both direction	
33	Polarization	Movement verification with fine speed selection	
34	Axis	Movement verification with Coarse speed	
54		selection	
35		Functional Verification of Electromechanical	
55		brakes	
36		Greasing of Slewing Bearing	
37		Oiling of Reduction Gear Boxes	
38		Visual inspection of FEED Positioner	
39	<b>T</b> . C	Check Timing belt tension of all axes and adjust if	
	I-Scanner	required	
40		Check control cable connections. Clean and secure	
41		Visual inspection of T Scanner Controller	
41	T Sconner	Check exterior and interior of motion controller	
+2	Controller	Adjustment / Tuning of axis motion through	
43	controller	optimizing the PID parameter in control software	
44		Verification of movement in forward (+) direction	
45		Verification of movement in reverse (-) direction	
		Limit to limit movement of linear slide axis in both	
46	T-Scanner	direction	
47	– Linear Slide	Movement verification with fine speed selection	
10	X-axis	Movement verification with Coarse speed	
40		selection	
48		Greasing of Linear Bearings/ Lm Guides	
49		Greasing of Rack & Pinion	
50		Verification of movement in forward (+) direction	
51		Verification of movement in reverse (-) direction	
52	_ ~	Limit to limit movement of linear slide axis in both	
	T-Scanner	direction	
53	– Linear Slide	Movement verification with fine speed selection	
54	Y -ax18	Movement verification with Coarse speed	
= =		Selection	
55 57		Greasing of Linear Bearings/ Lm Guides	
30 57	TSacana	Greasing of Kack & Pinion	
5/	I-Scanner	Verification of movement in roward (+) direction	
38	– Linear Slide	verification of movement in reverse (-) direction	

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59	Z-axis	Limit to limit movement of azimuth axis rotation in both direction	
60		Movement verification with fine speed selection	
61		Movement verification with Coarse speed selection	
62		Greasing of Slewing Bearing	
63		Oiling of Reduction Gear Boxes	
64		Verification of movement in forward (CW) direction	
65		Verification of movement in reverse (CCW) direction	
66	T-Scanner	Limit to limit movement of polarization axis rotation in both direction	
67	- Koll axis	Movement verification with fine speed selection	
68		Movement verification with Coarse speed selection	
69		Greasing of Slewing Bearing	
70		Oiling of Reduction Gear Boxes	
Any Sp rela P	pecific remark ted to DUT ositioner		
Any Sp related	pecific remark to T-Scanner		

Functional Inspection Performed by: \_\_\_\_\_

Remarks by NFTR - SAC Engineer: \_\_\_\_\_

SAC Engineer Present During Functional Inspection:

Remarks by NFTR Incharge: \_\_\_\_\_

NFTR Incharge Signature: \_\_\_\_\_



# **Annexure-IV: Compliance against RFP**













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3. System S	pecifica	tions					
3.1 Four (4) – a:	xis invertee	l T-scanner Sy	ystem			2.1:	
rotational az	ted 1-scanne	er – 1-Scanner is	a standard 4-axis	positio	ner naving	5-linear axes and	d 1-
	Table-0	l: Technical spec	ifications related	to T-So	canner		
Parameters		X-axis	Y-axis		Z-axis	Roll-axis	
Travel Range		9.0 m	6.0 m	(	).25 m	360 deg	
Travel Load ove	r axis	1750 kg	350 kg		60 kg	30 kg	
Structure Mater	101	250 mm/raz	Cast I	101/51	eei	5 dealers	
Velocity	max	500 mm/sec	500 mm/sec	20	mm/sec	12 deg/sec	
Mechanical Syste	m Planarity	500 11115 500	< 0.12	mm R	MS	12 002/300	$\neg$
Motor Drive Pov	ver	3/4 hp	3/4 hp		1/3 hp	1/20 hp	
Axis Accuracy R	MS	0.07+X(m)/300	0.07+Y(m)/300	0.05	+Z(m)/300	0.1deg	
Repeatability		< 0.05 mm	< 0.05 mm	<(	0.05 mm	<0.03 deg	
Positioning Accu Readout Resolut	ion	< 0.1 mm	< 0.1 mm	<	0.1 mm	<0.06 deg	
Operational mos	rement must l	ve without jerking	no position hunt	ting an	d noise free	<0.001 deg	m
		, , ,	<i>p</i> - <b>1</b>	<i>D</i> ,			
Tal	ble-02: Techn	ical specification	s related to T-Sca	anner a	xis alignm	ents	
Parameters Parallalism bature	on T common	Poll aris and 7			Unit S	+ 0.02	
Orthogonality bet	ween T-scame	ner Z-axis and Y-	axis		deg	± 0.02	
Orthogonality bet	ween T-scam	ner Y-axis and X-	-axis		deg	± 0.02	
212 (				. 11			11
3.1.2 4-axis 1-sca with built_in	PCU The fro	ont nanel of control	oller enables man	ual one	r is a stand ration by m	ard 4-axis contro leans of an operat	ting
axis selector	, display axis	selector, motor	speed and directi	on cont	trol knob. I	in the controller,	the
T-scanner a	xes are design	nated as:					
		Axis-01	X-axis				
		Axis-02	Y-axis				
		Axis-03	Z-axis	_			
		AXIS-04	Kon-axis	,			
	Table-03: 4	-axis T-Scanner 1	motion controller	Specifi	ications –		
Sr. No.	Descrip	otion		Spe	cification		
01 No. of	f Axis to be c	ontrolled	All four axes as	shown	in 3.1.2		
02 Axis (	onfigurabilit	iy .	All the four axe selectable as ne	s are sr r user d	multaneous lefined mes	s / sequentially asurement	
			configuration.				
PROPRIETARY NO? proprietary information	TICE - This ma of SAC. The c	aterial is the property ontents are for confi	y of Space Applicati idential use only and	ons Cen l are not	tre (ISRO) A to be disclos	hmedabad and cont ed to any others in	ains anv
manner, in whole or in	part, except with	the express written	approval of Space A	pplicatio	ns Centre (IS	SRO) Ahmedabad	6
	-	-	_	-		-	



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Sr.	No.	Dese	ription	Specification		
(	)3	Input Power Suj	pply	Single Phase, 230 Volts AC 50 Hz ±10 Indian standard	% as per	
(	)4	Motor Details o	f	DC servo Motors, Voltage Range: 80 -	115 Volt	
(	05	Axis-01, 02, 03 Encoder Details	& 04 of Axis- 01, 02,	Relative encoder En-DAT Protocol		
(	)6	Software limit f	or all 04 axes	Available		
		Table 04: 4 av	is T Segunar motion	controller Front Panel Specifications -		
Sr. No	Feat	ure	Specifications	comoner i rom i uner specificanons –		
1	E-ST (Eme	OP ergency Stop)	Latching Emergen Common circuit.	cy Stop Panic-Switch opens the motor Ar	mature	
2	Cont Wind	rol and Display dow	Segmented LED D (Linear), selectable	Display resolution 0.001° (Angular) or 0.0 e as per axis.	01mm	
3	Axis	Selection	Axis-1 to Axis-4 is selected control ax	s selected via multi position switch/knob a is	as per	
4	Limi Indic	t Switch ator	LED indication wh corresponding dire	hen the active axis reaches the limit of the action. CW (forward) or CCW (reverse)		
5	Spee Cont	d & Direction rol	Dual Function Kno for both Reverse o	bb/Potentiometer to provide manual veloc r Forward direction control	ity control	
6	Pane (loca	l/Bus l/remote) Select	Latching Illuminat control or front par	ed Pushbutton Switch. Selects either com nel Control.	puter	
7	Powe	er On/ Off ch	AC Input Power O	N/OFF. Illuminated when Unit is Power	ON.	
8	Dime	ensions	Compatible for ( 1 Solution	9") standard rack maximum 4U chassis, S	Single Box	
	Ta	ble-05: 4-axis T-	Scanner motion com	troller Rear Panel Interfaces Specification	ns –	
Sr. No.		Feature		Type of Connector		
1	Axi	s-1	M\$2474W16 260			
3	Axi	s-2 s-3	Nut Receptacle Par	nel Connector		
4	Axi	s-4				
5	Loc	al Control Unit	MS3102E-20-29S	W		
6	E-S	top	JMS 3476W10-6P			
7	Trig	gger Out	BNC (5V trigger p	ulse)		
8	Triș	gger In	BNC (5V trigger p	ulse)		
9	LAI	N/CAN	LAN or CAN for p	programming configuration as well as con	munication	
10	Pow	er Point	5-pin Power point			
11 3.2 I	our (	rlocking 4) – axis DUT	MS3470L10-6S Positioning Syst	tem		
PROT	DIFT	PV NOTICE T	material is the	v of Space Applications Comp. (CDO) 41-1-1-	and and contains	
proprie	RIETA. tarv inf	ormation of SAC. T	s material is the propert he contents are for confi	y of Space Applications Centre (ISRO) Anmeda idential use only and are not to be disclosed to a	nv others in anv	
Trobin		and a press of		and the start man and hot to be anteroyed to a	,	



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3.2.1 4-axis DUT and 1-linear	Positione axis.	er – DUT Positioner is	a standard 4-axi	is positioner having 3-r	otational axes
	Table-0	6: Technical specifical	tion related to D	UI-Positioner	
	Paramet	er	Unit	Specificatio	ns
Tu	no of Posit	tioner	Roll / Flev	o+ ation / Azimuth + Tine	ar Slide
Delivered To	roue	Polarization Axis	Kg-m	300	
Delivered 10	- que	Elevation Axis	Kg-m	1500	———————————————————————————————————————
		Azimuth Axis	Kg-m	390	
P <sup>gr`</sup>  	Polarization Axis	Kğ-m	580		
DUT weight 2	00 kg)	Elevation Axis	Kg-m	2250	
		Azimuth Axis	Kg-m	580	
Turntable Di	ameter	mm	625 mm		
Drive Pow	er	Polarization Axis	hp	3/4	
		Elevation Axis	hp	3/4	
		Azimuth Axis	hp	3/4	
		Linear Slide Axis	hp	1/3	
Maximum S	peed	Polarization Axis	deg/sec	3.0 (0.5 rpr	n)
		Elevation Axis	deg/sec	0.33 (40°/m	in)
		Azimuth Axis	deg/sec	3.0 (0.5 rpr	n)
		Linear Slide Axis	mm/sec	125	
Minimum Sp	peed	Polarization Axis	deg/sec	0.05	
		Elevation Axis	deg/sec	0.05	
		Azimuth Axis	deg/sec	0.05	
Desition Ass		Linear Slide Axis	mm/sec	20	
Position Accu	uracy	Polarization Axis	deg	0.03	
		A zimuth Axis	deg	0.03	
		Linear Slide Avis	mm	0.05	
Repeatabil	itv	Polarization Axis	dea	0.02	
repeation		Elevation Axis	deg	0.02	
		Azimuth Axis	deg	0.02	
		Linear Slide Axis	mm	0.05	
Travel Ran	ge	Polarization Axis	deg	360°	
	0-	Elevation Axis	deg	-25° to +92	0
		Azimuth Axis	deg	±200°	
		Linear Slide Axis	m	± 1.0	
Vertical Lo	ad	Polarization Axis	kg	1000	
		Azimuth Axis	kg	5000	
		Linear Slide Axis	kg	2000	
Bending Mor	nent	El = 0deg Axis	kg-m	1500	
PROPRIETARY NOT proprietary information manner, in whole or in p	TICE – Thi of SAC. Ti part, except	s material is the property o he contents are for confider with the express written app	f Space Applicatio: ntial use only and a proval of Space Ap	ns Centre (ISRO) Ahmedat are not to be disclosed to a plications Centre (ISRO) Al	pad and contains ny others in any hmedabad <b>8</b>



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	Paramet	er	Unit	Sp	ecificati	ons	
		El = 980deg Axi	s kg-m		2250		
1 1	Maximum Backlash	Flavation Axis	s deg		0.05		-
		Azimuth Axis	deg		0.05		-
	Electromechanic	al Brakes	5	In all 03 a	xes		
	Encoder Type	Polarization Axis	s I	Incremental er	icoders		
		Elevation Axis	_				
		Azimuth Axis	5				
		Linear Side Axi	5				
	Table-07: Tech	nical specifications r	elated to DUT-Pos	sitioner axis a	lignment	5	
Par	ameters		_	Unit	Speci	fications	
Para	allelism of DUT Roll ax	the aris with T-scanner Z	-axis	deg	±	0.02	
Ort	hogonality between DU	T Linear slide axis a	nd DUT azimuth a	xis deg		0.02	
Ort	hogonality between DU	T Azimuth and DUT	Elevation axis	deg		: 0.1	
Ort	hogonality between DU	T Elevation and DU	T Roll axis	deg	:	: 0.1	
	axis controller with be an operating axis sele controller, the DUT P	uilt-in PCU. The from ector, display axis set ositioner axes are de Axis-01 Axis-02	at paper of the content elector, motor spee esignated as: Azimuth axi Elevation axi	troller enables and directions is	operatic on contro	n by means 1 knob. In tl	4- of he
	axis controller with bi an operating axis sele controller, the DUT P	nilt-in PCU. The from ector, display axis se ositioner axes are de Axis-01 Axis-02 Axis-03 Axis-04 4-axis DUT-Position	A point routing in the content of th	er motion con troller enables ed and direction is is is le axis er Specificatio	operation on contro	a standard : n by means 1 knob. In tl	4- of the
Sr. No.	axis controller with bi an operating axis sele controller, the DUT P <i>Table-08: c</i> Descrip	nilt-in PCU. The from ector, display axis set ositioner axes are de Axis-01 Axis-02 Axis-03 Axis-04 <i>A</i> -axis DUT-Position Axis	A pool of the cont elector, motor spee signated as: Azimuth axi Elevation ax: DUT Roll ax DUT Roll ax DUT Linear Slid	er Specification Specification	operatic on contro ms – <b>n</b>	a standard - n by means l knob. In tl	4- of the
Sr. No. 01	axis controller with bi an operating axis sele controller, the DUT P <i>Table-08: 4</i> Descrip No. of Axis to be con	nilt-in PCU. The from ector, display axis set ositioner axes are de Axis-01 Axis-02 Axis-03 Axis-04 4-axis DUT-Position otion trolled	A pool of the cont elector, motor spee isignated as: Azimuth axi Elevation ax DUT Roll ax DUT Roll ax DUT Linear Slid her motion controlle	is is is is er Specification Specification iown in 3.2.2	ms – n	a standard - n by means l knob. In tl	4- of the
Sr. No. 01 02	axis controller with bi an operating axis sele controller, the DUT P <i>Table-08: 4</i> <b>Descrip</b> No. of Axis to be con Axis Configurability	nilt-in PCU. The from ector, display axis set ositioner axes are de Axis-01 Axis-02 Axis-03 Axis-04 Axis-04 A-axis DUT-Position Axis DUT-Position trolled	A pool of the cont elector, motor spee signated as: Azimuth axi Elevation ax DUT Roll ax DUT Roll ax DUT Linear Slid er motion controlle All four axes as sh All the four axes a selectable as per us configuration	er Specification ser dimensional ser specification ser dimensional ser since the service of the service ser defined m	ms – n us / seque	entially ent	4- of the
Sr. No. 01 02	axis controller with bi an operating axis sele controller, the DUT P <i>Table-08: 4</i> <b>Descrip</b> No. of Axis to be con Axis Configurability Input Power Supply	nilt-in PCU. The from ector, display axis set ositioner axes are de Axis-01 Axis-02 Axis-03 Axis-04 A-axis DUT-Position Axis DUT-Position trolled	A pool of the cont elector, motor spee isignated as: Azimuth axi Elevation ax: DUT Roll ax DUT Roll ax DUT Linear Slid ther motion controlled All four axes as sh All the four axes as selectable as per us configuration Single Phase, 230 Indian standard	er Specification ser defined m Volts AC 50	ms – n ms – n us / seque easurement	entially 6 as per	4- of the
Sr. No. 01 02 03 04	axis controller with bi an operating axis sele controller, the DUT P <i>Table-08: 4</i> <b>Descrip</b> No. of Axis to be con Axis Configurability Input Power Supply Motor Details of Axis	nilt-in PCU. The from ector, display axis see ositioner axes are de Axis-01 Axis-02 Axis-03 Axis-04 <i>A-axis DUT-Position</i> trolled	A pool of the cont elector, motor spee isignated as: Azimuth axi Elevation ax: DUT Roll ax DUT Roll ax DUT Linear Slid ther motion controlled All four axes as sh All the four axes as selectable as per us configuration Single Phase, 230 Indian standard DC servo Motors, Bi-directional	er Specification ser de single ser Specification ser de single ser Specification ser defined m Volts AC 50 1 Voltage Range	ms – ms – ms – m us / sequ easurem Hz ±10 %	entially 6 as per 15 Volt DC,	4- of the
<b>Sr.</b> No. 01 02 03 04 05	axis controller with bi an operating axis sele controller, the DUT P <i>Table-08: 4</i> <b>Descrip</b> No. of Axis to be con Axis Configurability Input Power Supply Motor Details of Axis Encoder Details of Axis	ailt-in PCU. The from ector, display axis set ositioner axes are de Axis-01 Axis-02 Axis-03 Axis-04 <i>A-axis DUT-Position</i> trolled s-01, 02, 03 & 04 axis-01, 02, 03, 04	A pool of the cont elector, motor spee isignated as: Azimuth axi Elevation ax: DUT Roll ax DUT Roll ax DUT Linear Slid are motion controlled All four axes as sh All the four axes as sh Configuration Single Phase, 230 Indian standard DC servo Motors, Bi-directional Relative Encoders	er Specification ser de ser de	ms – m ms – m us / sequ easuremo Hz ±10 %	entially 6 as per 15 Volt DC,	4- of the
Sr.         No.           01         02           03         04           05         06           07         07	axis controller with bi an operating axis sele controller, the DUT P <i>Table-08: 4</i> <b>Descrip</b> No. of Axis to be con Axis Configurability Input Power Supply Motor Details of Axis Encoder Details of Axis Electromechanical P	ailt-in PCU. The from ector, display axis see ositioner axes are de Axis-01 Axis-02 Axis-03 Axis-04 Ax	A pool of the cont elector, motor spee isignated as: Azimuth axi Elevation ax DUT Roll ax DUT Roll ax DUT Linear Slid her motion controlle All four axes as sh All the four axes as sh All the four axes as sh All the four axes as selectable as per us configuration Single Phase, 230 India standard DC servo Motors, Bi-directional Relative Encoders Available	er Specification specification ser defined m volts AC 50 Voltage Range	ms – m ms – m us / sequ easurem Hz ±10 %	entially 6 as per 15 Volt DC,	.4- of the
Sr.         No.           01         02           03         04           05         06           07	axis controller with bi an operating axis sele controller, the DUT P <i>Table-08: 4</i> <b>Descrip</b> No. of Axis to be con Axis Configurability Input Power Supply Motor Details of Axis Encoder Details of Axis Software limit for all Electromechanical Br axis	ailt-in PCU. The from ector, display axis set ositioner axes are de Axis-01 Axis-02 Axis-03 Axis-04 A-axis DUT-Position Axis-04 A-axis DUT-Position Axis-04 Ax	A pool of the cont elector, motor spee signated as: Azimuth axi Elevation ax: DUT Roll ax DUT Roll ax DUT Linear Slid er motion controlle All four axes as sh All the four axes a selectable as per us configuration Single Phase, 230 Indian standard DC servo Motors, Bi-directional Relative Encoders Available Available	er motion con troller enables d and direction is is is is er Specification Specification own in 3.2.2 re simultaneo ser defined m Volts AC 50 Voltage Rang	ms – m ms – m Hz ±10 % e: 80 – 1	entially 6 as per 15 Volt DC,	4- of the



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<u>é</u> n	ISPO	Ahmedabad – 380015	Ver 1.4	
Sr.	Table-09: 4-axis	5 DUT-Positioner motion controller Front Panel Specifications Specifications		
1	E-STOP	Latching Emergency Stop Panic-Switch opens the motor Ar	mature	
-	(Emergency Stop)	Common circuit.		
2	Window	Segmented LED Display resolution 0.001° (Angular) or 0.0 (Linear) selectable as per axis	01mm	
2	Arris Selection	Axis-1 to Axis-4 is selected via multi position switch/knob a	as per	
	Axis Selection	selected control axis		
4	Limit Switch	LED indication when the active axis reaches the limit of the corresponding direction. CW (forward) or CCW (reverse)		
c .	Speed & Direction	Dual Function Knob/Potentiometer to provide manual veloc	ity control	
2	Control	for both Reverse or Forward direction control	-	
6	Panel/Bus	Latching Illuminated Pushbutton Switch. Selects either com	puter	
-	Power On/ Off			
/	Switch AC Input Power ON/OFF. Illuminated when Unit is Power ON.			
8	Dimensions	Compatible for (19") standard rack maximum 4U chassis, S Solution	Single Box	
	Table-10: 4-axis DU	T-Positioner motion controller Rear Panel Interfaces Specifica	tions –	
Sr. No.	Feature	Type of Connector		
1	Axis-1	100 17 1W1 4 0 40		
2 3 4 5	Axis-2 Axis-3	MS3474W10-205 Nut Receptacle Panel Connector		
	Axis-4			
	Local Control Unit	MS3102E-20-29SW		
6	E-Stop	JMS 3476W10-6P		
8	Trigger Out Trigger In	BNC (5V trigger pulse) BNC (5V trigger pulse)		
9	LAN/CAN	LAN or CAN for programming configuration as well as comm	nunication	
10	Power Point	3-pin Power point		
11	Interlocking	MS3470L10-6S		
3.3 / The /	Automated test con Automated test configu	ifiguration and Data acquisition software ration and Data acquisition software is developed using low-lev	rel language.	
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Sr. No.         Description         Specification           01         Number of Modules         Data Acquisition Software has three modules namely:         1. Data Acquisition Module           01         Number of Modules         1. Data Acquisition Module         2. Data Analysis Module           3. Data Presentation Module         3. Data Presentation Module         3. Data Presentation Module           01         CW, List and Sweep frequency mode measurements.         3. Auguitation module has the following functions-           1. Automatic Scan setup, Computation and optimization of scan parameters.         3. Amplitude and phase data acquisition.           1. Continuous and steep mode.         5. Witch, multiple-channels and multiple-beams control.           7. Provision of Pause and Resume measurement control.         7. Provision of Pause and Resume measurement control.           7. Provision of Pause and Resume measurement control.         8. System Configuration file saved earlier. Configuration file generally contains. Project & antenna details, frequencies, channel and program details (like IP address), positioner configuration file saved earlier. Configuration file agreed, accleration, decleration, decleration etc.).           02         Data Analysis Module         Note the strene (intensity ploi) in real time to indicate the degree of completion. It is bould display the scan, step axis range and current position, frequency, quantity that is to be measured, file name etc. (the measurement effortion. It should display the scan, step axis range and current position, frequency, quantity th	हमा	 isro	Space Applications Centre Indian Space Research Organisation Ahmedabad – 380015	RFP Document Ver 1.4	
01       Number of Modules       Data Acquisition Software has three modules namely: <ol> <li>Data Acquisition Module</li> <li>Data Acquisition Module</li> <li>Data Acquisition Module</li> <li>Data Acquisition Module</li> </ol> 01         Mumber of Modules         Data Acquisition Module           2         Data Acquisition Module           3         Data Acquisition module has the following functions	Sr. No.	Description	Specification		
01       Number of Modules       1. Data Acquisition Module         2       Data Analysis Module         3. Data Presentation Module         3. Data Acquisition module has the following functions-         1. Automatic Scan setup, Computation and optimization of scan parameters.         2. CW, List and Sweep frequency mode measurements.         3. Amplitude and phase data acquisition.         4. Commission and step mode.         102       Data Acquisition Module         Data Acquisition Module       System Configuration Save/recall – Saving of last System Configuration file generally contains – Project & antema details, frequencies, channel and/or beam definition, transmit power of RF & LO sources, communication details (like IP address), positioner configuration file generally contains – Project & antema details, frequencies, channel and/or beam definition, transmit power of RF & LO sources, communication details (like IP address), positioner configuration details (free speed, scan speed, acceleration, deceleration etc.).         03       Rad Imm display + Saving of lans system Configuration file and resolution, deceleration etc.).         04       Data Analysis Module       Data Analysis/ processing module has the following Functions – 1. Measurement starts.         03       Data Analysis/       Data Analysis/ processing module has the following primetions – 1. Measured raw data files should include the following options- Transformation, Back-projection, Various systematic error correction         03       Data Analysis/       Dix Analysis/ p			Data Acquisition Software has three modules namely:		
0       Modules       2. Data Analysis Module         3       Data Presentation Module         4       Data Acquisition module has the following functions         1.       Automatic Scan setup. Computation and optimization of scan parameters.         2.       CW, List and Sweep frequency mode measurements.         3.       Amplitude and phase data acquisition.         4.       Continuous and step mode.         5.       Undirectional & Buitrectional mode.         6.       Switch, multiple-channels and multiple-beams control.         7.       Provision of Pause and Resume measurement control.         8.       System Configuration save/recall – Saving of last System Configuration file generally contains – Project & antenna details, frequencies, channel and/or beam definition, transmit power of RF & LO sources, communication details (like IP address), positioner configuration details (free speed, scan speed, acceleration, deceleration etc.).         7.       Real time display – Amplitude and Phase raw data should be displayed on the screen (intensity plot) in real time to indicate the degree of completion. It should display the scan, step axis range and current position, frequency, quantity that is to be measurement starts.         7.       Data Analysis         7.       Data Analysis/ processing module has the following potions- Transformation, Back-projection, Various systematic error correction         7.       Module       2.       N/W reliation pattern cuts for	01	Number of	1. Data Acquisition Module		
03       Data Presentation Module         04       Data Acquisition module has the following functions         1       Automatic Scan setup, Computation and optimization of scan parameters.         2       CW, List and Sweep frequency mode measurements.         3. Amplitude and phase data acquisition.         4. Continuous and step mode.         1       Undirectional & Buffarectional mode.         6       Switch, multiple-channels and multiple-bases control.         7       Provision of Pause and Resume measurement control.         8       System Configuration save/recall – Saving of last System Configuration file and recalling any Configuration file saved earbier. Configuration file generally contains – Project & antenna detals, fickency, channel and/or beam definition, transmit power of RF & LO sources, communication details (like IP address), positioner configuration details (free speed, scan speed, acceleration, deceleration etc.).         7       Real time display – Amplitude and Phase raw data should be displayed on the screen (intensity plot) in real time to indicate the degree of completion. It should display the scan, step axis range and current position, frequency, quantity that is to be measurement statts.         03       Data Analysis       Data Analysis / processing module has the following princtions –         03       Data Analysis       0       2. Write raw data file should include the following options- Transformation, Back-projection, Various systematic error correction         03       Data Anal	01	Modules	2. Data Analysis Module		
03         Data Acquisition module has the following functions-			3. Data Presentation Module		
03       Data Analysis Module       1. Automatic Scan setup, Computation and optimization of scan parameters.         03       Data Analysis Module       1. Automatic Scan setup, Computation and optimization of scan parameters.         03       Data Analysis Module       1. Automatic Scan setup, Computation and optimization of scan parameters.         03       Data Analysis Module       1. Automatic Scan setup, Computation and optimization of scan parameters.         03       Data Analysis Module       1. Automatic Scan setup, Computation and optimization of scan parameters overview for main parameters before measurement stats.         03       Data Analysis Module       1. Automatic Scan setup, Computation pattern, Gain, Directivity, Beam pointing.         04       Data Analysis Module       2. XYV/0 radiation pattern, Gain, Directivity, Beam pointing.         03       Data Analysis Module       2. XYV/0 radiation pattern, Gain, Directivity, Beam pointing.         03       Data Analysis Module       2. XYV/0 radiation pattern cuts for co and cross polarisation for amplitude and phase.         04       Data Analysis Module       2. XYV/0 radiation pattern deta pate.         10       Parameters overview and at files should include the following ptions- Transformation, Back-projection, Various systematic error correction         2. XYV/0 radiation pattern cuts for co and cross polarisation for amplitude and phase.       3. Cos and Cross-radiation pattern, Gain, Directivity, Beam pointing.			Data Acquisition module has the following functions-		
02       CW, List and Sweep Requery mode measurements.         3. Amplitude and phase data acquisition.         92       Continuous and step mode.         02       Data Acquisition Module         02       Acquisition Module         03       System Configuration save/recall – Saving of last System Configuration file and recalling any Configuration file saved earlier. Communication details (like IP address), positioner configuration details (free speed, scan speed, acceleration, deceleration etc.).         9.       Real time display - Amplitude and Phase raw data should be displayed on the screen (intensity plot) in real time to indicate the degree of completion. It should display the scan, step axis range and current position, frequency, quantity that is to be measurement starts.         03       Data Analysis Module       Data Analysis processing module has the following putches –         03       Data Analysis Module       NY/V radiation pattern cuts for co and cross polarisation for amplitude and phase.         03       Data Analysis Module       2. XY/V radiation pattern, Gain, Directivity, Beam pointing.         03 <t< td=""><td></td><td></td><td>1. Automatic Scan setup, Computation and optimization of scan</td><td>parameters.</td><td></td></t<>			1. Automatic Scan setup, Computation and optimization of scan	parameters.	
02       Acquisition         02       Arguistion         03       Module         04       Acquisition         05       System Configuration save/recall – Saving of last System Configuration file generally contains—Project & antenna details, frequencies, channel and/or beam definition, transmit power of RF & LO sources, communication details (like IP address), positioner configuration details (frequencies, channel and/or beam definition, transmit power of RF & LO sources, communication details (like IP address), positioner configuration details (frequency, quantity that is to be measurement position, frequency, quantity that is to be measurement faile mane etc. (the measurement definition, summary).         03       Data Analysis         03       Data Analysis         04       Or and Cross-radiation pattern. Quint for any pointion pattern of the sources of a completion. It should display the scan, step axis range and current position, frequency, quantity that is to be measurement Parameters overview for main parameters solefore measurement stats.         03       Data Analysis         04       Data Analysis         05       Avi/VP radiation pattern cuts for co and cross polarisation for amplitude and phase.         03       Data Analysis         04       Nodule         05       Nordial         06       Data Analysis         07       Nordial         08       Data Analysis         09       D			<ol> <li>CW, List and Sweep frequency mode measurements.</li> <li>Amplitude and phase data acquisition.</li> </ol>		
02       Data Acquisition Module       6       Svitch, multiple-beams control.         02       Data Acquisition Module       6       Svitch, multiple-beams and multiple-beams control.         03       Acquisition Module       5       System Configuration save/recall – Saving of last System Configuration file generally contains- Project & antenna details, frequencies, channel and/or beam definition, transmit power of RF & LO sources, communication details (like IP address), positioner configuration details (free speed, scan speed, acceleration, deceleration etc.).         9.       Real time display – Amplitude and Phase raw data should be displayed on the sources (memory) in real time to indicate the degree of completion. It should display the scan, step axis range and current position, frequency, quantity that is to be measured, file name etc. (the measurement definition summary).         10.       Parameters overview – Measurement Parameters overview for main parameters shall be displayed on screen for quick check of all set parameters before measurement stats.         03       Data Analysis Module       Oata Analysis         04       Data Analysis         05       N/V radiation pattern cuts for co and cross polarisation for amplitude and phase.         03       Data Analysis         04       Measured raw data files should include the following options- Transformation, Back-projection, Various systematic error correction         0.       X/V/P radiation pattern cuts for co and cross polarisation for amplitude and phase.         0.			<ol><li>Continuous and step mode.</li></ol>		
02       Data Acquisition Module       Provision of Pause and Resume measurement control.         02       Data Acquisition Module       System Configuration save/recall – Saving of Nats System Configuration file generally contains.– Project & antenna details, frequencies, chamel and/or beam definition, transmit power of RF & LO sources, communication details (like IP address), positioner configuration details (free speed, scan speed, acceleration, deceleration etc.).         9.       Real time display – Amplitude and Phase raw data should be displayed on the screen (intensity plot) in real time to indicate the degree of completion. It should display the scan, step axis range and current position, frequency, quantity that is to be measured, file name etc. (the measurement definition summary).         10.       Parameters overview – Measurement Parameters overview for main parameters before measurement starts.         03       Data Analysis Module       Data Analysis processing module has the following Functions –         03       Data Analysis Module       2. XFV/0 radiation pattern cuts for co and cross polarisation for amplitude and phase.         03       Data Analysis Module       2. XFV/0 radiation pattern, Gain, Directivity, Beam pointing.         11.       Beam peak, Beamyeidh, Side lobes, Null depth with ther location.         2.       Cros and Cross-polar isolation etc.         3.       Normalizzation of data to value and peak.			<ol> <li>Unidirectional &amp; Bidirectional mode.</li> <li>Switch multiple channels and multiple beams control</li> </ol>		
02       Data Acquisition Module       8. System Configuration save/recall – Saving of last System Configuration file and recalling any Configuration file saved earlier. Configuration file generally contains Project & antenna details, frequencies, channel and/or beam definition, transmit power of RF & LO sources, communication details (like IP address), positioner configuration details (free speed, scan speed, acceleration, deceleration etc.).         9. Real time display - Amplitude and Phase raw data should be displayed on the screen (intensity plot) in real time to indicate the degree of completion. It should display the scan, step axis range and current position, frequency, quantity that is to be measured, file name etc. (the measurement definition summary).         10. Parameters shall be displayed on screen for quick check of all set parameters before measurement starts.         Data Analysis Module       Data Analysis/ processing module has the following pructions – 1. Measured raw data files should include the following options- Transformation, Back-projection, Various systematic error correction         03       Data Analysis Module       2. X/Y/Φ radiation pattern cuts for co and cross polarisation for amplitude and phase.         0. Co and Cross-radiation pattern.       3. Co and Cross-radiation pattern.         10. Phase centre position prediction from measured data.       3. Normalization of data to value and peak.	<ul> <li>7. Provision of Pause and Resume measurement control.</li> <li>8. System Configuration save/recall – Saving of last System file and recalling any Configuration file saved earlier. Con</li> </ul>				
02       Acquisition Module       In the and recalling any Configuration the saved earlier Comfiguration in the generally contains— Project & antenna details, frequencies, channel and/or beam definition, transmit power of RF & LO sources, communication details (like IP address), positioner configuration details (free speed, scan speed, acceleration, deceleration etc.).         9.       Real time display – Amplitude and Phase raw data should be displayed on the screen (intensity plot) in real time to indicate the degree of completion. It should display the scan, step axis range and current position, frequency, quantity that is to be measured, file name etc. (the measurement definition summary).         10.       Parameters overview – Measurement Parameters overview for main parameters before measurement starts.         03       Data Analysis         Module       Data Analysis processing module has the following putctions –         1.       Measured raw data files should include the following options– Transformation, Back-projection, Various systematic error correction         03       Data Analysis       2.         Module       2.       X/Y/0 radiation pattern cuts for co and cross polarisation for amplitude and phase.         03       Data Analysis       2.         Module       2.       Nord ad Cross-polar isolation etc.         3.       Data Analysis processing module has the following options– Transformation of data to value and peak.		Data	<ol> <li>System Configuration save/recall – Saving of last System C</li> <li>Shared and line are Configuration file and and line Configuration</li> </ol>	onfiguration	
Module       beam definition, transmit power of RF & LO sources, communication details (like IP address), positioner configuration details (free speed, scan speed, acceleration, deceleration etc.).         9. Real time display – Amplitude and Phase raw data should be displayed on the screen (intensity plot) in real time to indicate the degree of completion. It should display the scan, step axis range and current position, frequency, quantity that is to be measured, file name etc. (the measurement definition summary).         10. Parameters overview – Measurement Parameters overview for main parameters before measurement starts.         11. Data Analysis         Module         12. Data Analysis         Module         13. Data Analysis         Module         14. Medule         15. Co and Cross-radiation pattern cuts for co and cross systematic error correction         16. Xerial raw data files should include the following options– Transformation, Back-projection, Various systematic error correction         15. Co and Cross-radiation pattern cuts for co and cross polarisation for amplitude and phase.         16. Co and Cross-radiation pattern. Gain, Directivity, Beam pointing.         17. Beam peak, Beamwidth, Side lobes, Null depth with their location.         18. Cross-polar level and AR pattern.         19. Phase centre position prediction from measured data.         19. Normalization of data to value and peak.	02	Acquisition	generally contains – Project & antenna details, frequencies, ch	annel and/or	
03       Data Analysis Module       2       X/Y/\$\Phi radiation pattern cuts for co and cross polarisation for amplitude and phase.         03       Data Analysis Module       2       X/Y/\$\Phi radiation pattern cuts for co and cross polarisation for amplitude and phase.         03       Data Analysis Module       2       X/Y/\$\Phi radiation pattern cuts for co and cross polarisation for amplitude and phase.         10       Parameters is before measurement cuts for co and cross polarisation for amplitude and phase.       3         103       Data Analysis Module       Data Analysis Module       Data Analysis No dual       Data Analysis Parameters operation pattern cuts for co and cross polarisation for amplitude and phase.         10       Parameters is before measurement cuts for co and cross polarisation for amplitude and phase.       3         103       Data Analysis Module       2       X/Y/\$\P radiation pattern cuts for co and cross polarisation for amplitude and phase.         11       Measured revel and AR pattern.       1       Phase centre position prediction from measured data.         12       N/YA\$\P radiation pattern.       Gata Analysis amplitude and phase.       1         13       Deam peak, Beamwidth, Side lobes, Null depth with their location.       1         14       Beam peak, Beamwidth, Side lobes, Null depth with their location.       1         15       Cross-polar level and Cross-polar isolation etc.		Module	beam definition, transmit power of RF & LO sources, con	nmunication	
03       Data Analysis Module       9. Keal time display – Amplitude and Phase raw data should be displayed on the screen (intensity plot) in real time to indicate the degree of completion. It should display the scan, step axis range and current position, frequency, quantity that is to be measured, file name etc. (the measurement definition summary).         10.       Parameters overview – Measurement Parameters overview for main parameters shall be displayed on screen for quick check of all set parameters before measurement starts.         03       Data Analysis Module       Data Analysis/ processing module has the following Functions –         1.       Measured raw data files should include the following options- transformation, Back-projection, Various systematic error correction         2.       X/Y/Ø radiation pattern cuts for co and cross polarisation for amplitude and phase.         3.       C oa and Cross-radiation pattern, Gain, Directivity, Beam pointing.         4.       Beam peak, Beamwidth, Side lobes, Null depth with their location.         5.       Cross-polar level and Cross-polar isolation etc.         6.       Axial ratio (AR) and AR pattern.         7.       Phase centre position prediction from measured data.         8.       Normalization of stare to value and peak.			details (like IP address), positioner configuration details (free speed acceleration deceleration etc.)	speed, scan	
03       Data Analysis Module       Data Analysis Module       2.       X/Y/Ø radiation pattern cuts for co and cross polarisation for amplitude and phase.         03       Data Analysis Module       2.       X/Y/Ø radiation pattern cuts for co and cross polarisation for amplitude and phase.         03       Data Analysis Module       2.       X/Y/Ø radiation pattern cuts for co and cross polarisation for amplitude and phase.         03       Data Analysis Module       2.       X/Y/Ø radiation pattern cuts for co and cross polarisation for amplitude and phase.         03       Data Analysis Module       2.       X/Y/Ø radiation pattern cuts for co and cross polarisation for amplitude and phase.         03       Data Analysis Module       2.       X/Y/Ø radiation pattern cuts for co and cross polarisation for amplitude and phase.         03       Data Analysis Module       2.       X/Y/Ø radiation pattern cuts for co and cross polarisation for amplitude and phase.         0.       Co and Cross-radiation pattern.       Gain. Directivity, Beam pointing.         1.       Beam peak, Beamwidth, Side lobes, Null depth with their location.         2.       Cross-polar level and Cross-polar isolation etc.         3.       Normalization of data to value and peak.	9. Real time display the screen (intensi It should display to quantity that is to summary).		<ol> <li>Real time display – Amplitude and Phase raw data should be a</li> </ol>	displayed on	
03       Data Analysis Module       Data Analysis Module       Data Analysis Module       Data Analysis Data Analysis       Data Analysis Processing module has the following Functions –         03       Data Analysis Module       2       X/Y/Φ radiation pattern cuts for co and cross polarisation for amplitude and phase.         03       Data Analysis Module       2       X/Y/Φ radiation pattern cuts for co and cross polarisation for amplitude and phase.         03       Data Analysis Module       2       X/Y/Φ radiation pattern cuts for co and cross polarisation for amplitude and phase.         03       Data Analysis Module       2       X/Y/Φ radiation pattern cuts for co and cross polarisation for amplitude and phase.         1       Measured raw data files should include the following options- Transformation, Back-projection, Various systematic error correction         2       X/Y/Φ radiation pattern cuts for co and cross polarisation for amplitude and phase.         3       C os and Cross-radiation pattern. Gain, Directivity, Beam pointing.         4       Beam peak, Beamwidth, Side lobes, Null depth with their location.         5       C ross-polar level and Cross-polar isolation etc.         6       Axial ratio (AR) and AR pattern.         7       Phase centre position prediction from measured data.         8       Normalization of data to value and peak.		the screen (intensity plot) in real time to indicate the degree of It should dimber the scene stars grip range and surrent position	completion.		
summary).       10. Parameters overview – Measurement Parameters overview for main parameters shall be displayed on screen for quick check of all set parameters before measurement starts.         03       Data Analysis         03       Data Analysis         04       Module         05       Co and Cross-radiation pattern cuts for co and cross polarisation for amplitude and phase.         3       Co and Cross-radiation pattern cuts for co and cross polarisation for amplitude and phase.         3       Co and Cross-radiation pattern. Gain, Directivity, Beam pointing.         4       Beam peak, Beamwidth, Side lobes, Null depth with their location.         5       Cross-polar level and Cross-polar isolation etc.         6       Axial ratio (AR) and AR pattern.         7       Phase centre position prediction from measured data.         8       Normalization of data to value and peak.			quantity that is to be measured, file name etc. (the measureme	nt definition	
03       Data Analysis Module       10. Parameters overview – Measurement Parameters overview for main parameters shall be displayed on screen for quick check of all set parameters before measurement starts.         03       Data Analysis Module       Data Analysis Correction         03       Data Analysis Module       Data Analysis Module         03       Data Analysis Module       1. Measured raw data files should include the following options– Transformation, Back-projection, Various systematic error correction         2.       X/Y/Φ radiation pattern cuts for co and cross polarisation for amplitude and phase.         3.       Co and Cross-radiation pattern, Gain, Directivity, Beam pointing.         4.       Beam peak, Beamwidth, Side lobes, Null depth with their location.         5.       Cross-polar level and Cross-polar isolation etc.         6.       Axial ratio (AR) and AR pattern.         7.       Phase centre position prediction from measured data.         8.       Normalization of data to value and peak.			summary).		
03       Data Analysis/         04       0         05       Data Analysis/         06       Data Analysis/         07       Data Analysis/         08       Data Analysis/         09       Data Analysis/         01       Data Analysis/         02       X/Y/Ф radiation pattern cuts for co and cross polarisation for amplitude and phase.         03       C o and Cross-radiation pattern, Gain, Directivity, Beam pointing.         04       Beam peak, Beamwidth, Side lobes, Null depth with their location.         05       Cross-polar level and Cross-polar isolation etc.         06       Axial ratio (AR) and AR pattern.         07       Phase centre position prediction from measured data.         07       Phase			<ol> <li>Parameters overview – Measurement Parameters overvier parameters shall be displayed on screen for quick check</li> </ol>	w for main of all set	
03       Data Analysis/ processing module has the following Functions –         03       Data Analysis Module       1. Measured raw data files should include the following options– Transformation, Back-projection, Various systematic error correction         03       Data Analysis Module       2. X/Y/Φ radiation pattern cuts for co and cross polarisation for amplitude and phase.         3.       Co and Cross-radiation pattern, Gain, Directivity, Beam pointing.         4.       Beam peak, Beamwidth, Side lobes, Null depth with their location.         5.       Cross-polar level and Cross-polar isolation etc.         6.       Axial ratio (AR) and AR pattern.         7.       Phase centre position prediction from measured data.         8.       Normalization of data to value and peak.			parameters before measurement starts.		
03       Data Analysis Module       1. Measured raw data files should include the following options- Transformation, Back-projection, Various systematic error correction         03       Data Analysis Module       2. X/Y/Φ radiation pattern cuts for co and cross polarisation for amplitude and phase.         3.       Co and Cross-radiation pattern, Gain, Directivity, Beam pointing.         4.       Beam peak, Beamwidth, Side lobes, Null depth with their location.         5.       Cross-polar level and Cross-polar isolation etc.         6.       Axial ratio (AR) and AR pattern.         7.       Phase centre position prediction from measured data.         8.       Normalization of data to value and peak.         PROPRIETARY NOTICE – This material is the property of Space Applications Centre (ISRO) Ahmedabad and contains proprietary information of SAC. The contents are for confidential use only and are not to be disclosed to any others in any manner. in whole or in part except with the express written approval of Space Applications Centre (ISRO) Ahmedabad			Data Analysis/ processing module has the following Functions -		
03       Data Analysis Module       2. X/Y/Φ radiation pattern cuts for co and cross polarisation for amplitude and phase.         0.3       Data Analysis Module       2. X/Y/Φ radiation pattern cuts for co and cross polarisation for amplitude and phase.         2.       X/Y/Φ radiation pattern cuts for co and cross polarisation for amplitude and phase.         3       C on and Cross-radiation pattern, Gain, Directivity, Beam pointing.         4       Beam peak, Beamwidth, Side lobes, Null depth with their location.         5       Cross-polar level and Cross-polar isolation etc.         6       Axial ratio (AR) and AR pattern.         7       Phase centre position prediction from measured data.         8       Normalization of data to value and peak.			<ol> <li>Measured raw data files should include the following options Transformation Back-projection Various systematic error</li> </ol>	- DT	
03       Data Analysis Module       2. X/Y/Φ radiation pattern cuts for co and cross polarisation for amplitude and phase.         3.       Co and Cross-radiation pattern, Gain, Directivity, Beam pointing.         4.       Beam peak, Beamwidth, Side lobes, Null depth with their location.         5.       Cross-polar level and Cross-polar isolation etc.         6.       Axial ratio (AR) and AR pattern.         7.       Phase centre position prediction from measured data.         8.       Normalization of data to value and peak.			correction	51	
05       Module       and phase.         3.       Co and Cross-radiation pattern, Gain, Directivity, Beam pointing.         4.       Beam peak, Beamwidth, Side lobes, Null depth with their location.         5.       Cross-polar level and Cross-polar isolation etc.         6.       Axial ratio (AR) and AR pattern.         7.       Phase centre position prediction from measured data.         8.       Normalization of data to value and peak. <b>PROPRIETARY NOTICE</b> – This material is the property of Space Applications Centre (ISRO) Ahmedabad and contains proprietary information of SAC. The contents are for confidential use only and are not to be disclosed to any others in any manner, in whole or in part excent with the express written approval of Space Applications Centre (ISRO) Ahmedabad	03 Data Analysis	2. X/Y/Φ radiation pattern cuts for co and cross polarisation for	amplitude		
4. Beam peak, Beamwidth, Side lobes, Null depth with their location.         5. Cross-polar level and Cross-polar isolation etc.         6. Axial ratio (AR) and AR pattern.         7. Phase centre position prediction from measured data.         8. Normalization of data to value and peak.         PROPRIETARY NOTICE – This material is the property of Space Applications Centre (ISRO) Ahmedabad and contains proprietary information of SAC. The contents are for confidential use only and are not to be disclosed to any others in any manner, in whole or in part except with the express written approval of Space Applications Centre (ISRO) Ahmedabad	03	Module	and phase. 3 Co and Cross-radiation pattern Gain Directivity Ream point	ting	
5. Cross-polar level and Cross-polar isolation etc.         6. Axial ratio (AR) and AR pattern.         7. Phase centre position prediction from measured data.         8. Normalization of data to value and peak. <b>PROPRIETARY NOTICE</b> – This material is the property of Space Applications Centre (ISRO) Ahmedabad and contains proprietary information of SAC. The contents are for confidential use only and are not to be disclosed to any others in any manner, in whole or in part except with the express written anyword of Space Applications Centre (ISRO) Ahmedabad			<ol> <li>Beam peak, Beamwidth, Side lobes, Null depth with their loc</li> </ol>	ation.	
PROPRIETARY NOTICE – This material is the property of Space Applications Centre (ISRO) Ahmedabad and contains     proprietary information of SAC. The contents are for confidential use only and are not to be disclosed to any others in any     manner, in whole or in part, except with the express written approval of Space Applications Centre (ISRO) Ahmedabad and contains			<ol> <li>Cross-polar level and Cross-polar isolation etc.</li> <li>Avial ratio (AP) and AP nattern</li> </ol>		
8. Normalization of data to value and peak.      PROPRIETARY NOTICE – This material is the property of Space Applications Centre (ISRO) Ahmedabad and contains     proprietary information of SAC. The contents are for confidential use only and are not to be disclosed to any others in any     manner, in whole or in part, except with the express written approval of Space Applications Centre (ISRO) Ahmedabad			<ol> <li>Axiai faile (AK) and AK pattern.</li> <li>Phase centre position prediction from measured data.</li> </ol>		
<b>PROPRIETARY NOTICE</b> – This material is the property of Space Applications Centre (ISRO) Ahmedabad and contains proprietary information of SAC. The contents are for confidential use only and are not to be disclosed to any others in any manner, in whole or in part except with the express written approval of Space Amplications Centre (ISRO) Abmedabad <b>1</b>			<ol><li>Normalization of data to value and peak.</li></ol>		
<b>PROPRIETARY NOTICE</b> – This material is the property of Space Applications Centre (ISRO) Ahmedabad and contains proprietary information of SAC. The contents are for confidential use only and are not to be disclosed to any others in any manner, in whole or in part, except with the express written approval of Space Applications Centre (ISRO) Abmedabad					
manner, in whole or in part, except with the express written approval of Space Applications Centre (ISRO) Abmadabad	PROP	RIETARY NOTICE	- This material is the property of Space Applications Centre (ISRO) Ahmedab AC. The contents are for confidential use only and are not to be disclosed to an ended.	ad and contains	
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4. Dei 1.1 Driv	tails o 7e Parts/	f Parts/Comj Components list of	oonents used in Positioning Systems f4-axis inverted T-Scanner –	ystem	
Sr No.	Axis Details	Part	Detailed Specification		
1.1		Motor	Permanent Magnet DC Servomotor, Type: M4-29 YY0Y3-225, Callan Technology Make, Tacho 7.0 4.07Nm, 115 Vdc 11.3 Adc 3000 rpm	52A- W	
1.2		Encoder	FENAC Make, FNC 58B 10630V5000-R5, PPR - VCC - 5-30V dc, Sr No: 86909D21RDEA446, Tu Made	· 5000 ırkish	
1.3		Gear Box	DYNABOX EXPERT, Girard Transmissions Typ 75E3UCH2F, No: 1061000903001/01, (Lubricate Mobil)	e: d by	
1.4 Li X-	Linear X-axis	Limit Switch	Telemecanique XCE102C, IEC600947 – 5 – 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity	: 15-240V only	
1.5	-	Homing Switch	Telemecanique XCE102C, IEC600947 – 5 – 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC AC 3A DC: 13-22V DC 0 3A IP65 Same Polarity	: 15-240V only	
1.6 1.7		LM Guide ways Rack & Pinion	LM Hiwin Guideways & Blocks HR45 Gudel Rack & Pinion Module 5		
1.8	1	Panel Connector	MS3474W16-26S		
1.9		Connector for end-1	MS3476W16-26P		
1.10		Connector for end-2	MS3476W16-26P		
2.1		Motor	Permanent Magnet DC Servomotor, Type: N YY001-142, Callan Technology Make, Sr No: 2 Tacho 7.0V 1.6Nm, 115 Vdc 2.8 Adc 2000 rpm	I4-2006D- 11129526,	
2.2		Encoder	BTH Incremental Rotary Encoder, Model: BI-33 L5, Supply: 5V DC Line Driver 2000 PPR	3H8-2000-	
2.3	<b>T</b> .	Gear Box	DYNABOX EXPERT, Girard Transmission 45E30CH2F, No: 106-1000603002/01 (Lubr Mobil)	ns Type: icated by	
2.4	Linear Y-axis	Limit Switch	Telemecanique XCE102C, IEC600947 – 5 – 1 GB Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V A 13-22V DC 0.3A IP65 Same Polarity only	/T140485, C 3A DC:	
2.5		Homing Switch	Telemecanique XCE102C, IEC600947 – 5 – 1 GB Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V A 13-22V DC 0.3A IP65 Same Polarity only	/T140485, C 3A DC:	
2.6	1	LM Guide ways	LM Hiwin Guideways & Blocks HR45		
2.7	]	Rack & Pinion	Gudel Rack & Pinion Module 5		
2.8		Panel Connector	MS3474W16-26S		
PROPRIE proprietary manner, in	TARY NO v information whole or in	TICE – This material is th n of SAC. The contents are part, except with the expres	e property of Space Applications Centre (ISRO) Ahmedabac for confidential use only and are not to be disclosed to any ss written approval of Space Applications Centre (ISRO) Ahm	l and contains others in any edabad 13	



r No.Axis DetailsPartDetailed Specification2.9Connector for end-1MS3476W16-26P2.10Connector for end-2MS3476W16-26P3.1MotorYY001-142, Sr No: 211129525, Tacho 7.0V 1.6Nm, 115 Vdc 2.8 Adc 2000 rpm, Callan Technology Make3.2EncoderAutonics (Rotary Encoder), Model: E4056-2000-6L-5 5V dc $\pm$ 5%, Lot No. VG08R Made in Korea3.3Ball ScrewC3 Precession class Hardened and ground Pitch 5 mm & Diameter 30 mm3.4Linear Z-axisLimit Switch3.5Limit SwitchUi: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only3.6Homing SwitchUi: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only3.6LM Guide waysLM Hiwin Guideways & Blocks IR453.7Ball ScrewPMI 25 x 1000 mm3.8Panel Connector MS3476W16-26P3.10Connector for end-1MS3476W16-26P4.1MotorYY001-142, Sr No: 211129527, Tacho 7.0V 1.6Nm 115 Vdc 2.8 Adc 2000 pm, Callan Technology Make4.2EncoderMS3476W16-26P4.3Gear Box28 Adc 2000 pm, Callan Technology Make4.4RollDYNABOX EXPERT, Girard Transmissions Type: 45E30CH2F, No: 106-100903002/02 (Lubricated by Mobil)4.4RollLimit Switch4.5Homing SwitchUi: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only4.5Homing SwitchUi: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarit	Sr No.         Axis Details         Part         Detailed Specification           2.9         Connector for end-1         MS3476W16-26P           2.10         Connector for end-2         MS3476W16-26P           3.1         Motor         Permanent Magnet DC Servomotor, Type: M4-2006D- YY001-142, Sr No: 211129252, Tacho 7.0V 1.6Nm, 115 Vdc 2.8 Adc 2000 rpm, Callan Technology Make           3.2         Motor         C3 Precession class Hardened and ground Pitch 5 mm & Diameter 30 mm           3.4         Linear Z-axis         Limit Switch         C3 Precession class Hardened and ground Pitch 5 mm & Diameter 30 mm           3.5         Ball Screw         C3 Precession class Hardened and ground Pitch 5 mm & Diameter 30 mm           3.6         Limit Switch         U: 300V Ump: 4KV lht: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only           3.6         LM Guide ways         LM Hiwin Guideways & Blocks HR45           3.9         Ball Screw         PMI 25 x 1000 mm           9.9         Connector for end-1         MS3476W16-26P           4.1         Motor         Y001-142, Sr No: 211129527, Tacho 7.0V 1.6Nm 115 Vdc 2.8 Adc 2000 rpm, Callan Technology Make           4.2         Motor         Permanent Magnet DC Servomotor, Type: M4-2006D- YY001-142, Sr No: 211129527, Tacho 7.0V 1.6Nm 115 Vdc 2.8 Adc 2000 rpm, Callan Technology Make           4.1         Motor         Permanent Ma	इसरो डिल्व	Indian S	ndian Space Research Organisation Document Ahmedabad – 380015 Ver 1.4	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	2.9       Connector for end-1       MS3476W16-26P         2.10       Connector for end-2       MS3476W16-26P         3.1       Motor       Permanent Magnet DC Servomotor, Type: M4-2006D- YY001-142, Sr No: 211129525, Tacho 7.0V 1.6Nm, 115 Vdc 2.8 Adc 2000 rpm, Callan Technology Make         3.2       Encoder       Autonics (Rotary Encoder), Model: E4056-2000-6-L-5 5V dc $\pm 5\%$ , Lot No. VG08R Made in Korea         3.3       Ball Screw       C3 Precession class Hardened and ground Pitch 5 mm & Diameter 30 mm         3.4       Limear       Limit Switch       U: 300V Ump: 4KV Ih: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only         3.6       Homing Switch       U: 300V Ump: 4KV Ih: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only         3.6       I.M Guide ways       LM Hiwin Guideways & Blocks HR45         3.9       Panel Connector for end-1       MS3476W16-26P         4.1       Motor       Y901-142, Sr No: 211129527, Tacho 7.0V 1.6Nm 115 Vdc 2.8 Adc 2000 rpm, Callan Technology Make         4.2       Encoder       BTH Incremental Rotary Encoder, Model: BI-38H8-2000- L5, Supply: SV DC Line Driver 2000 PPR DYNABOX EXPERT, Girard Transmissions Type: 45B0CH2F, No: 106-1000903002/02 (Lubricated by Mobil)         4.4       Roll axis       Limit Switch       Telemecanique XCE102C, IEC600947-5-1GB/T140485, U: 300V Umy: 4KV Ih: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only         45	Sr No. Axis Details	Part	Detailed Specification	
2.10         Connector for end-2         MS3476W16-26P           3.1         Motor         Permanent Magnet DC Servomotor, Type: M4-2006D- YY001-142, Sr No: 211129525, Tacho 7.0V 1.6Nm, 115 Vdc 2.8 Adc 2000 ppm, Callan Technology Make           3.2         Encoder         Autonics (Rotary Encoder), Model: E4056-2000-6-L-5 5V dc ± 5%, Lot No. VG08R Made in Korea           3.3         Ball Screw         Diameter 30 mm           3.4         Limear         Limit Switch         Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only           3.5         Homing Switch         Telemecanique XCE102C, IEC600947 - 5 - 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only           3.6         I.M Guide ways         LM Hiwin Guideways & Blocks HR45           3.7         Ball Screw         PMI 25 x 1000 mm           7.8         Panel Connector for end-1         MS3476W16-26P           Connector for end-2         MS3476W16-26P           Connector for end-2         BTH Incremental Rotary Encoder, Model: BI-38H8-2000- L5, Supply: SV DC Line Driver 2000 PPR           4.1         Motor         YY001-142, Sr No: 211129527, Tacho 7.0V 1.6Nm 115 Vdc 2.8 Adc 2000 pm, Callan Technology Make           4.2         Encoder         BTH Incremental Rotary Encoder, Model: BI-38H8-2000- L5, Supply: SV DC Line Driver 2000 PPR           4.3         Gear Box	2.10       Connector for end-2       MS3476W16-26P         3.1       Motor       Permanent Magnet DC Servomotor, Type: M4-2006D- YY001-142, Sr No: 211129525, Tacho 7.0V 1.6Nm, 115 Vdc 2.8 Adc 2000 rpm, Callan Technology Make         3.2       Autonics (Rotary Encoder), Model: E4056-2000-6-L-5 5V dc ± 5%, Lot No. VG08R Made in Korea         3.3       Ball Screw       C3 Precession class Hardened and ground Pitch 5 mm & Diameter 30 mm         3.4       Limear       Limit Switch       C3 Precession class Hardened and ground Pitch 5 mm & Diameter 30 mm         3.5       Felemecanique XCE102C, IEC600947 - 5 - 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only         3.6       Telemecanique XCE102C, IEC600947 - 5 - 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only         3.6       ILM Guide ways       LM Hiwin Guideways & Blocks HR45         3.7       Ball Screw       PMI 25 x 1000 mm         9       Connector for end-1       MS3476W16-268         Connector for end-2       MS3476W16-26P         Connector for end-2       MS3476W16-26P         Connector for end-3       MS3476W16-26P         Connector for end-2       MS3476W16-26P         Connector for end-2       MS3476W16-26P         Connector for end-1       MS3476W16-26P         Gear Box       45E30C	2.9	Connector for end-1	MS3476W16-26P	
3.1MotorPermanent Magnet DC Servomotor, Type: M4-2006D- YY001-142, Sr No: 211129525, Tacho 7.0V 1.6Nm, 115 Vdc 2.8 Adc 2000 rpm, Callan Technology Make3.2EncoderAutonics (Rotary Encoder), Model: E4056-2000-6-L-5 5V dc $\pm$ 5%, Lot No. VG08R Made in Korea3.3Ball ScrewC3 Precession class Hardened and ground Pitch 5 mm & Diameter 30 mm3.4LinearLimit SwitchTelemecanique XCE102C, IEC600947 - 5 - 1 GB/T140485, Ui: 300V Ump: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only3.5Homing SwitchTelemecanique XCE102C, IEC600947 - 5 - 1 GB/T140485, Ui: 300V Ump: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only3.6I.M Guide waysLM Hiwin Guideways & Blocks HR453.7Ball ScrewPMI 25 x 1000 mm9Panel ConnectorMS3474W16-268Connector for end-1MS3476W16-26PConnector for end-2MS3476W16-26P4.1MotorPermanent Magnet DC Servomotor, Type: M4-2006D- YY001-142, Sr No: 211129527, Tacho 7.0V 1.6Nm 115 Vdc 2.8 Adc 2000 rpm, Callan Technology Make4.2EncoderBTH Incremental Rotary Encoder, Model: BI-38H8-2000- L5, Supply: SV DC Lime Driver 2000 PRR DYNABOX EXPERT, Grard Transmissions Type: 45E30CH2F, No: 106-100090302/02 (Lubricated by Mobil)4.4axisTelemecanique XCE102C, IEC600947 - 5 - 1 GB/T140485, Ui: 300V Ump: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only4.5Homing SwitchTelemecanique XCE102C, IEC600947 - 5 - 1 GB/T140485, Ui: 300V Ump: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only	3.1       Motor       Permanent Magnet DC Servomotor, Type: M4-2006D- YY001-142, Sr No: 211129525, Tacho 7.0V 1.6Nm, 115 Vdc 2.8 Adc 2000 rpm, Callan Technology Make         3.2       Encoder       Autonics (Rotary Encoder), Model: E4056-2000-6-L-5 5V dc ± 5%, Lot No. VG08R Made in Korea         3.3       Ball Screw       C3 Precession class Hardened and ground Pitch 5 mm & Diameter 30 mm         3.4       Linear Z-axis       Limit Switch       U: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only         3.6       Homing Switch       U: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only         3.6       I.M Guide ways       LM Hiwin Guideways & Blocks HR45         3.7       Ball Screw       PMI 25 x 1000 mm         9       Connector for end-1       MS3476W16-26P         Connector for end-2       MS3476W16-26P         Connector for end-2       MS3476W16-26P         4.1       Motor       Permanent Magnet DC Servomotor, Type: M4-2006D- YY001-142, Sr No: 211129527, Tacho 7.0V 1.6Nm 115 Vdc 2.8 Adc 2000 rpm, Callan Technology Make         4.1       Motor       Permanent Magnet DC Servomotor, Type: M4-2006D- YY001-142, Sr No: 211129527, Tacho 7.0V 1.6Nm 115 Vdc 2.8 Adc 2000 rpm, Callan Technology Make         4.1       Motor       Permanent Magnet DC Servomotor, Type: M4-2006D- YY001-142, Sr No: 106-1000903002/02 (Lubricated by Mobil)         4.3       Ge	2.10	Connector for end-2	MS3476W16-26P	
3.2     Autonics (Rotary Encoder), Model: E4056-2000-6-L-5 5V dc ± 5%, Lot No. VG08R Made in Korea       3.3     Ball Screw     C3 Precession class Hardened and ground Pitch 5 mm & Diameter 30 mm       3.4     Limear Z-axis     Limit Switch     U: 300V Ump; 4KV Ih: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only       3.5     Homing Switch     U: 300V Ump; 4KV Ih: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only       3.6     I.M Guide ways     LM Hiwin Guideways & Blocks HR45       3.7     Ball Screw     PMI 25 x 1000 mm       3.8     Panel Connector     MS3476W16-268       Connector for end-1     MS3476W16-26P       Connector for end-2     MS3476W16-26P       4.1     Motor     Permanent Magnet DC Servomotor, Type: M4-2006D- YY001-142, Sr No: 211129527, Tacho 7.0V 1.6Nm 115 Vdc 2.8 Adc 2000 rpm, Callan Technology Make       4.2     Encoder     BTH Incremental Rotary Encoder, Model: BI-38H8-2000- L5, Supply: 5V DC Line Driver 2000 PPR       4.3     Gear Box     4530CL2F, No: 106-100093002/02 (Lubricated by Mobil)       4.4     Roll axis     Limit Switch     Telemecanique XCE102C, IEC600947 - 5 - 1 GB/T140485, U: 300V Ump: 4KV Ih: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only       4.5     Homing Switch     U: 300V Ump: 4KV Ih: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only	3.2       Image: Second	3.1	Motor	Permanent Magnet DC Servomotor, Type: YY001-142, Sr No: 211129525, Tacho 7.0V 1. 115 Vdc 2.8 Adc 2000 rpm, Callan Technology	M4-2006D- 5Nm, Make
3.3       Ball Screw       C3 Precession class Hardened and ground Pitch 5 mm & Diameter 30 mm         3.4       Linear       Limit Switch       Telemecanique XCE102C, IEC600947 – 5 – 1 GB/T140485, U: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only         3.5       Homing Switch       Telemecanique XCE102C, IEC600947 – 5 – 1 GB/T140485, U: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only         3.6       IM Guide ways       LM Hiwin Guideways & Blocks HR45         3.7       Ball Screw       PMI 25 x 1000 mm         3.8       Panel Connector       MS3474W16-268         3.9       Connector for end-1       MS3476W16-26P         Connector for end-2       MS3476W16-26P         Connector for end-2       MS3476W16-26P         4.1       Motor       YY001-142, Sr No: 211129527, Tacho 7.0V 1.6Nm 115 Vdc 2.8 Adc 2000 rpm, Callan Technology Make         4.2       Encoder       BTH Incremental Rotary Encoder, Model: BI-38H8-2000-L5, Supply: 5V DC Line Driver 2000 PPR         4.3       Gear Box       45E30CH2F, No: 106-1000903002/02 (Lubricated by Mobil)         4.4       Limit Switch       Telemecanique XCE102C, IEC600947 – 5 – 1 GB/T140485, U: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only         4.5       Homing Switch       U: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity	3.3       Ball Screw       C3 Precession class Hardened and ground Pitch 5 mm & Diameter 30 mm         3.4       Limear       Limit Switch       Telemecanique XCE102C, EC600947 - 5 - 1 GB/T140485, U: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only         3.5       Homing Switch       Telemecanique XCE102C, EC600947 - 5 - 1 GB/T140485, U: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only         3.6       Homing Switch       U: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only         3.6       I.M Guide ways       LM Hiwin Guideways & Blocks HR45         3.7       Ball Screw       PMI 25 x 1000 mm         9       Panel Connector       MS3476W16-268         Connector for end-1       MS3476W16-26P         Connector for end-2       MS3476W16-26P         4.1       Motor       Permanent Magnet DC Servomotor, Type: M4-2006D-YY001-142, Sr No: 211129527, Tacho 7.0V 1.6Nm 115 Vdc 2.8 Adc 2000 rpm, Callan Technology Make         4.2       Encoder       BTH Incremental Rotary Encoder, Model: BI-38H8-2000-L5, Supply: 5V DC Line Driver 2000 PPR         4.3       Gear Box       45E30CH2F, No: 106-1000903002/02 (Lubricated by Mobil)         4.4       axis       Limit Switch       U: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only         4.4       Limit Switch       U: 3	3.2	Encoder	Autonics (Rotary Encoder), Model: E4056-20 dc ± 5%, Lot No. VG08R Made in Korea	00-6-L-5 5V
Drameter 30 mmTelemecanique XCE102C, IEC600947 – 5 – 1 GB/T140485, U: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity onlyTelemecanique XCE102C, IEC600947 – 5 – 1 GB/T140485, U: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity onlyAdditional SwitchU: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity onlyAdditional SwitchU: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity onlyAdditional SwitchPale ConnectorMS3476W16-268Connector for end-1MS3476W16-26POcimeter for end-1MS3476W16-26POcimeter for end-2MS3476W16-26POcimeter for end-2MS3476W16-26PEncoderEncoderPermanent Magnet DC Servomotor, Type: M4-2006D- YY001-142, Sr No: 211129527, Tacho 7.0V 1.6Nm 115 Vdc 2.8 Adc 2000 rpm, Callan Technology MakeBTH Incremental Rotary Encoder, Model: BI-38H8-2000- L5, Supply: SV DC Line Driver 2000 PPRDYNABOX EXPERT, Girard Transmissions Type: 4.3Gear Box45E30CH2F, No: 106-1000903002/02 (Lubricated by Mobil)Telemecanique XCE102C, IEC600947 – 5 – 1 GB/T140485, U: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity onlyTelemecanique XCE102C, IEC600947 –	3.4       Linear Z-axis       Limit Switch       Telemecanique XCE102C, IEC600947 – 5 – 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only         3.5       Homing Switch       Telemecanique XCE102C, IEC600947 – 5 – 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only         3.6       LM Guide ways       LM Hiwin Guideways & Blocks HR45         3.7       Ball Screw       PMI 25 x 1000 mm         3.8       Panel Connector       MS3474W16-26F         3.0       Connector for end-1       MS3476W16-26P         3.10       Connector for end-2       MS3476W16-26P         4.1       Motor       Permanent Magnet DC Servomotor, Type: M4-2006D- YY001-142, Sr No: 211129527, Tacho 7.0V 1.6Nm 115 Vdc 2.8 Adc 2000 rpm, Callan Technology Make         4.2       Encoder       BTH Incremental Rotary Encoder, Model: BI-38H8-2000- L5, Supply: 5V DC Line Driver 2000 PPR         4.3       Gear Box       45B30CH2F, No: 106-1000903002/02 (Lubricated by Mobil)         4.4       axis       Limit Switch       Telemecanique XCE102C, IEC600947 – 5 – 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only         4.5       Homing Switch       Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only	3.3	Ball Screw	C3 Precession class Hardened and ground Pit	tch 5 mm &
3.5Telemecanique XCE102C, IEC600947 – 5 – 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only3.6LM Guide waysLM Hiwin Guideways & Blocks HR453.7Ball ScrewPMI 25 x 1000 mm3.8Panel ConnectorMS3474W16-26S3.9Connector for end-1MS3476W16-26P3.10Connector for end-2MS3476W16-26P4.1MotorPermanent Magnet DC Servomotor, Type: M4-2006D- YY001-142, Sr No: 211129527, Tacho 7.0V 1.6Nm 115 Vdc 2.8 Adc 2000 rpm, Callan Technology Make4.2EncoderBTH Incremental Rotary Encoder, Model: BI-38H8-2000- L5, Supply: 5V DC Line Driver 2000 PPR4.3Gear Box45E30CH2F, No: 106-1000903002/02 (Lubricated by Mobil)4.4Roll axisLimit SwitchTelemecanique XCE102C, IEC600947 – 5 – 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only4.5Homing SwitchTelemecanique XCE102C, IEC600947 – 5 – 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only	3.5       Homing Switch       Telemecanique XCE102C, IEC600947 – 5 – 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only         3.6       I.M Guide ways       I.M Hiwin Guideways & Blocks HR45         3.7       Ball Screw       PMI 25 x 1000 mm         3.8       Panel Connector       MS3474W16-26S         3.9       Connector for end-1       MS3476W16-26P         3.10       Connector for end-2       MS3476W16-26P         4.1       Motor       Permanent Magnet DC Servomotor, Type: M4-2006D- YY001-142, Sr No: 211129527, Tacho 7.0V 1.6Nm 115 Vdc 2.8 Adc 2000 rpm, Callan Technology Make         4.2       Encoder       BTH Incremental Rotary Encoder, Model: BI-38H8-2000- L5, Supply: 5V DC Line Driver 2000 PPR         4.3       Gear Box       45E30CH2F, No: 106-1000903002/02 (Lubricated by Mobil)         4.4       axis       Limit Switch       Telemecanique XCE102C, IEC600947 – 5 – 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only         4.5       Homing Switch       Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only	3.4 Linear Z-axis	Limit Switch	Telemecanique XCE102C, IEC600947 – 5 – 1 C Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V 13-22V DC 0.3A IP65 Same Polarity only	GB/T140485, AC 3A DC:
3.6       LM Guide ways       LM Hiwin Guideways & Blocks HR45         3.7       Ball Screw       PMI 25 x 1000 mm         3.8       Panel Connector       MS3474W16-26S         3.9       Connector for end-1       MS3476W16-26P         3.10       Connector for end-2       MS3476W16-26P         4.1       Motor       Permanent Magnet DC Servomotor, Type: M4-2006D- YY001-142, Sr No: 211129527, Tacho 7.0V 1.6Nm 115 Vdc 2.8 Adc 2000 rpm, Callan Technology Make         4.2       Encoder       BTH Incremental Rotary Encoder, Model: BI-38H8-2000- L5, Supply: 5V DC Line Driver 2000 PPR         4.3       Gear Box       45E30CH2F, No: 106-1000903002/02 (Lubricated by Mobil)         4.4       Roll axis       Telemecanique XCE102C, IEC600947 - 5 - 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only         4.5       Homing Switch       Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only	3.6       LM Guide ways       LM Hiwin Guideways & Blocks HR45         3.7       Ball Screw       PMI 25 x 1000 mm         3.8       Panel Connector       MS3474W16-26S         3.9       Connector for end-1       MS3476W16-26P         3.10       Connector for end-2       MS3476W16-26P         4.1       Motor       YY001-142, Sr No: 211129527, Tacho 7.0V 1.6Nm 115 Vdc         4.2       Encoder       BTH Incremental Rotary Encoder, Model: BI-38H8-2000-L5, Supply: 5V DC Line Driver 2000 PPR         4.3       Gear Box       DYNABOX EXPERT, Girard Transmissions Type: 45E30CH2F, No: 106-1000903002/02 (Lubricated by Mobil)         4.4       axis       Limit Switch       Telemecanique XCE102C, IEC600947 – 5 – 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only         4.5       Homing Switch       Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-20V DC Uimp VIIMP	3.5	Homing Switch	Telemecanique XCE102C, IEC600947 – 5 – 1 C Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V 13-22V DC 0.3A IP65 Same Polarity only	GB/T140485, AC 3A DC:
3.7         Ball Screw         PMI 25 x 1000 mm           3.8         Panel Connector         MS3474W16-26S           3.9         Connector for end-1         MS3476W16-26P           3.10         Connector for end-2         MS3476W16-26P           4.1         Motor         Permanent Magnet DC Servomotor, Type: M4-2006D- YY001-142, Sr No: 211129527, Tacho 7.0V 1.6Nm 115 Vdc 2.8 Adc 2000 rpm, Callan Technology Make           4.2         Encoder         BTH Incremental Rotary Encoder, Model: BI-38H8-2000- L5, Supply: 5V DC Line Driver 2000 PPR           4.3         Gear Box         45E30CH2F, No: 106-1000903002/02 (Lubricated by Mobil)           4.4         Roll axis         Telemecanique XCE102C, IEC600947 - 5 - 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only           4.5         Homing Switch         Telemecanique XCE102C, IEC600947 - 5 - 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only	3.7       Ball Screw       PMI 25 x 1000 mm         3.8       Panel Connector       MS3474W16-26S         3.9       Connector for end-1       MS3476W16-26P         3.10       Connector for end-2       MS3476W16-26P         4.1       Motor       YY001-142, Sr No: 211129527, Tacho 7.0V 1.6Nm 115 Vdc         4.1       Motor       YY001-142, Sr No: 211129527, Tacho 7.0V 1.6Nm 115 Vdc         4.2       Encoder       BTH Incremental Rotary Encoder, Model: BI-38H8-2000-L5, Supply: 5V DC Line Driver 2000 PPR         4.3       Gear Box       45E30CH2F, No: 106-1000903002/02 (Lubricated by Mobil)         4.4       axis       Limit Switch       Telemecanique XCE102C, IEC600947 – 5 – 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only         4.5       Homing Switch       Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only	3.6	LM Guide ways	LM Hiwin Guideways & Blocks HR45	
3.8         Panel Connector         MS34/4W16-26S           3.9         Connector for end-1         MS3476W16-26P           3.10         Connector for end-2         MS3476W16-26P           4.1         Motor         Permanent Magnet DC Servomotor, Type: M4-2006D- YY001-142, Sr No: 211129527, Tacho 7.0V 1.6Nm 115 Vdc 2.8 Adc 2000 rpm, Callan Technology Make           4.2         Encoder         BTH Incremental Rotary Encoder, Model: BI-38H8-2000- L5, Supply: 5V DC Line Driver 2000 PPR           4.3         Gear Box         45E30CH2F, No: 106-1000903002/02 (Lubricated by Mobil)           4.4         Roll axis         Telemecanique XCE102C, IEC600947 - 5 - 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only           4.5         Homing Switch         Telemecanique XCE102C, IEC600947 - 5 - 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only	3.8       Panel Connector       MS34/4W16-26S         3.9       Connector for end-1       MS3476W16-26P         3.10       Connector for end-2       MS3476W16-26P         4.1       Motor       Permanent Magnet DC Servomotor, Type: M4-2006D- YY001-142, Sr No: 211129527, Tacho 7.0V 1.6Nm 115 Vdc 2.8 Adc 2000 rpm, Callan Technology Make         4.2       Encoder       BTH Incremental Rotary Encoder, Model: BI-38H8-2000- L5, Supply: 5V DC Line Driver 2000 PPR         4.3       Gear Box       45E30CH2F, No: 106-1000903002/02 (Lubricated by Mobil)         4.4       axis       Limit Switch       Telemecanique XCE102C, IEC600947 – 5 – 1 GB/T140485, 13-22V DC 0.3A IP65 Same Polarity only         4.5       Homing Switch       Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only	3.7	Ball Screw	PMI 25 x 1000 mm	
3.9       Connector for end-1       MS34/6W16-26P         3.10       Connector for end-2       MS3476W16-26P         4.1       Motor       Permanent Magnet DC Servomotor, Type: M4-2006D- YY001-142, Sr No: 211129527, Tacho 7.0V 1.6Nm 115 Vdc 2.8 Adc 2000 rpm, Callan Technology Make         4.2       Encoder       BTH Incremental Rotary Encoder, Model: BI-38H8-2000- L5, Supply: 5V DC Line Driver 2000 PPR         4.3       Gear Box       45E30CH2F, No: 106-1000903002/02 (Lubricated by Mobil)         4.4       axis       Telemecanique XCE102C, IEC600947 - 5 - 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only         4.5       Homing Switch       Telemecanique XCE102C, IEC600947 - 5 - 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only	3.9       Connector for end-1       MS34/6W16-26P         3.10       Connector for end-2       MS3476W16-26P         4.1       Motor       YY001-142, Sr No: 211129527, Tacho 7.0V 1.6Nm 115 Vdc 2.8 Adc 2000 rpm, Callan Technology Make         4.2       Encoder       BTH Incremental Rotary Encoder, Model: BI-38H8-2000- L5, Supply: 5V DC Line Driver 2000 PPR         4.3       Gear Box       45E30CH2F, No: 106-1000903002/02 (Lubricated by Mobil)         4.4       axis       Limit Switch       Telemecanique XCE102C, IEC600947 – 5 – 1 GB/T140485, 13-22V DC 0.3A IP65 Same Polarity only         4.5       Homing Switch       Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only	3.8	Panel Connector	MS34/4W10-20S	
S.10       Connector for end-2       M33476W16-26F         4.1       Motor       Permanent Magnet DC Servomotor, Type: M4-2006D- YY001-142, Sr No: 211129527, Tacho 7.0V 1.6Nm 115 Vdc 2.8 Adc 2000 rpm, Callan Technology Make         4.2       Encoder       BTH Incremental Rotary Encoder, Model: BI-38H8-2000- L5, Supply: 5V DC Line Driver 2000 PPR         4.3       Gear Box       DYNABOX EXPERT, Girard Transmissions Type: 45E30CH2F, No: 106-1000903002/02 (Lubricated by Mobil)         4.4       axis       Telemecanique XCE102C, IEC600947 - 5 - 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only         4.5       Homing Switch       Telemecanique XCE102C, IEC600947 - 5 - 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only	3.10       Connector for end-2       MIS3476W16-26P         4.1       Motor       Permanent Magnet DC Servomotor, Type: M4-2006D- YY001-142, Sr No: 211129527, Tacho 7.0V 1.6Nm 115 Vdc 2.8 Adc 2000 rpm, Callan Technology Make         4.2       Encoder       BTH Incremental Rotary Encoder, Model: BI-38H8-2000- L5, Supply: 5V DC Line Driver 2000 PPR         4.3       Gear Box       DYNABOX EXPERT, Girard Transmissions Type: 45E30CH2F, No: 106-1000903002/02 (Lubricated by Mobil)         4.4       axis       Limit Switch       Telemecanique XCE102C, IEC600947 – 5 – 1 GB/T140485, 13-22V DC 0.3A IP65 Same Polarity only         4.5       Homing Switch       Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only	3.9	Connector for end-1	MS34/0W10-20P	
4.1       Motor       Permanent Magnet DC Servomotor, Type: M4-2006D- YY001-142, Sr No: 211129527, Tacho 7.0V 1.6Nm 115 Vdc 2.8 Adc 2000 rpm, Callan Technology Make         4.2       Encoder       BTH Incremental Rotary Encoder, Model: BI-38H8-2000- L5, Supply: 5V DC Line Driver 2000 PPR         4.3       Gear Box       45E30CH2F, No: 106-1000903002/02 (Lubricated by Mobil)         4.4       axis       Limit Switch       Telemecanique XCE102C, IEC600947 - 5 - 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only         4.5       Homing Switch       Telemecanique XCE102C, IEC600947 - 5 - 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only	4.1       Motor       Permanent Magnet DC Servomotor, Type: M4-2006D- YY001-142, Sr No: 211129527, Tacho 7.0V 1.6Nm 115 Vdc 2.8 Adc 2000 rpm, Callan Technology Make         4.2       Encoder       BTH Incremental Rotary Encoder, Model: BI-38H8-2000- L5, Supply: SV DC Line Driver 2000 PPR         4.3       Gear Box       DYNABOX EXPERT, Girard Transmissions Type: 45E30CH2F, No: 106-1000903002/02 (Lubricated by Mobil)         4.4       Roll axis       Limit Switch       Telemecanique XCE102C, IEC600947 – 5 – 1 GB/T140485, 13-22V DC 0.3A IP65 Same Polarity only         4.5       Homing Switch       Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only	5.10	Connector for end-2	M33470W10-20F	
4.2       Encoder       BTH Incremental Rotary Encoder, Model: BI-38H8-2000-L5, Supply: 5V DC Line Driver 2000 PPR         4.3       Gear Box       DYNABOX EXPERT, Girard Transmissions Type: 45E30CH2F, No: 106-1000903002/02 (Lubricated by Mobil)         4.4       axis       Limit Switch       Telemecanique XCE102C, IEC600947 - 5 - 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only         4.5       Homing Switch       Telemecanique XCE102C, IEC600947 - 5 - 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only	4.2     Encoder     BTH Incremental Rotary Encoder, Model: BI-38H8-2000- L5, Supply: 5V DC Line Driver 2000 PPR       4.3     Gear Box     DYNABOX EXPERT, Girard Transmissions Type: 45E30CH2F, No: 106-1000903002/02 (Lubricated by Mobil)       4.4     Roll axis     Limit Switch     Telemecanique XCE102C, IEC600947 - 5 - 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only       4.5     Homing Switch     Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-00V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC:	4.1	Motor	Permanent Magnet DC Servomotor, Type: YY001-142, Sr No: 211129527, Tacho 7.0V 1.6 2.8 Adc 2000 rpm, Callan Technology Make	M4-2006D- Nm 115 Vdc
4.3       Gear Box       DYNABOX EXPERT, Girard Transmissions Type: 45E30CH2F, No: 106-1000903002/02 (Lubricated by Mobil)         4.4       Roll axis       Limit Switch       Telemecanique XCE102C, IEC600947 - 5 - 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only         4.5       Homing Switch       Telemecanique XCE102C, IEC600947 - 5 - 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only	4.3       Gear Box       DYNABOX EXPERT, Girard Transmissions Type: 45E30CH2F, No: 106-1000903002/02 (Lubricated by Mobil)         4.4       Roll axis       Limit Switch       Telemecanique XCE102C, IEC600947 - 5 - 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only         4.5       Homing Switch       Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-00V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC:	4.2	Encoder	BTH Incremental Rotary Encoder, Model: BI L5, Supply: 5V DC Line Driver 2000 PPR	-38H8-2000-
Roll axis         Limit Switch         Telemecanique XCE102C, IEC600947 - 5 - 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only           4.5         Homing Switch         Telemecanique XCE102C, IEC600947 - 5 - 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only           4.5         Homing Switch         Telemecanique XCE102C, IEC600947 - 5 - 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only	Roll axis     Limit Switch     Telemecanique XCE102C, IEC600947 - 5 - 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only       4.5     Homing Switch     Telemecanique XCE102C, IEC600947 - 5 - 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC:	4.3	Gear Box	DYNABOX EXPERT, Girard Transmiss 45E30CH2F, No: 106-1000903002/02 (Lu Mobil)	ions Type: bricated by
4.5 Homing Switch Telemecanique XCE102C, IEC600947 – 5 – 1 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V AC 3A DC: 13-22V DC 0.3A IP65 Same Polarity only	4.5 Homing Switch Ui: 300V Limp: 4KV Ith: 104, AC: 15,240V AC 3A DC:	4.4 Roll axis	Limit Switch	Telemecanique XCE102C, IEC600947 – 5 – 1 C Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V 13-22V DC 0.3A IP65 Same Polarity only	GB/T140485, AC 3A DC:
	13-22V DC 0.3A IP65 Same Polarity only	4.5	Homing Switch	Telemecanique XCE102C, IEC600947 – 5 – 1 C Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V 13-22V DC 0.3A IP65 Same Polarity only	B/T140485, AC 3A DC:
4.6 Bearing SKF make bearing SKF-01	4.6 Bearing SKF make bearing SKF-01	4.6	Bearing	SKF make bearing SKF-01	
4.7 Panel Connector MIS34/4W10-20S	4.7 Panel Connector M534/4W10-208	4.7	Connector for and 1	M334/4W10-205 MS3476W16 26P	
4.8 Connector for and 1 MS3476W16.26P	4.9 Connector for end-2 MS3476W16-26P	4.9	Connector for end-2	MS3476W16-26P	
4.8 Connector for end-1 MS3476W16-26P 4.9 Connector for end-2 MS3476W16-26P	S1 Grass Far harring Kublar	5.1	Granes Far harris	Kubler	
4.8         Connector for end-1         MS3476W16-26P           4.9         Connector for end-2         MS3476W16-26P           5.1         Grasse For bearing         Kubler	Flectrical papel	5.1	Electrical nanel	IXU0EI	
4.8     Connector for end-1     MS3476W16-26P       4.9     Connector for end-2     MS3476W16-26P       5.1     Grease For bearing     Kubler       Electrical panel     Connector for end-2     MS3476W16-26P	5.2 Schneider	2	wiring	Schneider	
4.6 Bearing SKF make bearing SKF-01 4.7 Panel Connector MS3474W16-26S	4.6     Bearing     SKF make bearing SKF-01       4.6     Bearing     SKF make bearing SKF-01       4.7     Panel Connector     MS3474W16-26S       4.8     Connector for end-1     MS3476W16-26P       4.9     Connector for end-2     MS3476W16-26P       5.1     Grease For bearing     Kubler	4.2         Roll axis           4.4         axis           4.5         4.6           4.7         4.8           4.9         5.1	Gear Box Limit Switch Homing Switch Bearing Panel Connector Connector for end-1 Connector for end-2 Grease For bearing Electrical panel	L5, Supply: 5V DC Line Driver 2000 PPR DYNABOX EXPERT, Girard Transmiss 45E30CH2F, No: 106-1000903002/02 (Lu Mobil) Telemecanique XCE102C, IEC600947 – 5 – 1 ( Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V 13-22V DC 0.3A IP65 Same Polarity only Telemecanique XCE102C, IEC600947 – 5 – 1 ( Ui: 300V Uimp: 4KV Ith: 10A, AC: 15-240V 13-22V DC 0.3A IP65 Same Polarity only SKF make bearing SKF-01 MS3476W16-26S MS3476W16-26P Kubler	ions Type: bricated by BB/T140485, AC 3A DC: BB/T140485, AC 3A DC:
4.8 Connector for end-1 MS3476W16-26P	4.9 Connector for end-2 MS3476W16-26P	4.9	Connector for end-2	MS3476W16-26P	
4.8         Connector for end-1         MS3476W16-26P           4.9         Connector for end-2         MS3476W16-26P	5.1 Grease For bearing Kubler	5.1	Grease For bearing	Kubler	
4.8         Connector for end-1         MS3476W16-26P           4.9         Connector for end-2         MS3476W16-26P           5.1         Grasse For bearing         Kubler	Electrical panel	5.1	Electrical panel		
4.8     Connector for end-1     MS3476W16-26P       4.9     Connector for end-2     MS3476W16-26P       5.1     Grease For bearing     Kubler       5.2     Electrical panel     Charter	5.2 Schneider		wiring	Schneider	



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	Sr No.	Axis	Part	Detailed Specification			
	5.3	Details	Timing Belts	Fenner make			
	4.2 Dri Sr	ive Parts/C	omponents list of	4-axis T-Scanner motion controller –			
	No.	Details	Part	Detailed Specification			
	1.1		DC Servo Drive	100 volt 30 ampere, ADVANCED Motion Controls Part No. AB30A200I - X			
	1.2		SMPS	Siemens Make 50 Amp 90 volt DC Part No. 6EP1336- 11 D00			
	1.3	Linear X-	Remote IO	Selector Card 8-16 Beckhoff Make Part No. XB6cd226B			
	1.4         Bias Control         Ballutt Switch with relay (for Li           1.5         Remote I/o Beckhoff 40 input 24	Balluff Switch with relay (for Limits) Remote I/o Beckhoff 40 input 24 output Part No. RIO-					
	1.5		Remote IO	PM-00E (Ethercat Remote IO)			
	1.6		Panel Connector	Amphenol Make MS3474W16-26S			
	2.1		DC Servo Drive	100 volt 30 ampere, ADVANCED Motion Controls Part No. AB30A200I - X			
	2.2		SMPS	Siemens make 50 Amp 90 volt DC Part No. 6EP1336- 11 D00			
	2.3	Linear Y-	Remote IO	Selector Card 8-16 Beckhoff Make Part No. XB6cd226B			
	2.4	axis	Bias Control	Balluff Switch with relay (for Limits) Remote I/o Beckhoff 40 input 24 output Part No. RIO-			
	2.5		Remote IO	PM-00E (Ethercat Remote IO)			
	2.6		Panel Connector	Amphenol Make MS3474W16-26S			
	3.1		DC Servo Drive	100 volt 30 ampere, ADVANCED Motion Controls Part No. AB30A2001 - X			
	3.2		SMPS	Siemens make 50 Amp 90 volt DC Part No. 6EP1336-			
	3.3	Linear Z-	Remote IO	Selector Card 8-16 Beckhoff Make Part No. XB6cd226B			
	3.4	axis	Bias Control	Balluff Switch with relay (for Limits)			
	3.5		Remote IO	Remote I/o Beckhoff 40 mput 24 output Part No. RIO- PM-00E (Ethercat Remote IO)			
	3.6		Panel Connector	Amphenol Make M\$3474W16-26\$			
	4.1		DC Servo Drive	100 volt 30 ampere, ADVANCED Motion Controls Part No. AB30A200I - X			
	4.2	Roll axis	SMPS	Siemens make 50 Amp 90 volt DC Part No. 6EP1336- 11 D00			
	4.3		Remote IO	Selector Card 8-16 Beckhoff Make Part No. XB6cd226B			



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Sr No.	Axis Details	Part	Detailed Specification		
4.4		Bias Control	Balluff Switch with relay (for Limits)		
4.5		Remote IO	Remote I/o Beckhoff 40 input 24 output Part 1 PM-00E (Ethercat Remote IO)	No. RIO-	
4.6		Panel Connector	Amphenol Make MS3474W16-26S		
5.1		Linear Fast Switching DIO	Lenze Make, Fast Switching Module Part 1 0010 Galvanic isolated	No. El21-24-	
5.2		Remote IO	Beckhoff Make Part No. Ek1101-0090 Remote ID-Switch	e Bus Station	
5.3		SMPS	Siemens Make Control Power Supply 24/12 Amp	/5 V DC 10	
5.4	Other	Siemens	Power Filter unit Meanwell for Trigger pulse	Th ( 01	
5.5	components	Relay Board	Brake unit for Servo motor Schneider Electric	PM-01	
5.0	of T-	Panel Connector	Ampnenol MS3102E20-29SW (LCU Interface	e) hit for E hus	
5.0	Scanner	Remote IO Remote IO	Techo Ecodback unit for 0.10 welt analog in E	12 revenue	
5.0	Motion	Relay	Relay Card Sigmans Make 220 volt / 5 Amn	13777	
5 10	Controller	Power Contactor	Schneider Make Part No. Sc10 Power Contact	or	
5.11		RTOS	Linx Make RT License for Motion controller		
5.12		Driver File	DLL for Ethercat Bus to support various hardware ( by OEM)	(Custom made	
5.13		Push Buttons	Schneider Make standard		
5.14		Potentiometer Knob	Takushi Make		
4.3 Dri Sr No	ive Parts/C Axis Details	omponents list of Part	4-axis DUT-Positioner – Detailed Specification		
1.1	Details	Motor	Permanent Magnet DC Servomotor, Type: M- YY0Y3-225, Sr No: 211129531, Tacho 7.0V 115 Vdc 11.3 Adc 3000 rpm. Callan Technolo	4-2952A- 4.07Nm ogy Make	
1.2		Encoder	FENAC, FNC 58B 10630V5000-R5, PPR - 2 5-30V dc, Sr No: 86904L21AC015, Turkish N	000 VCC - Iade	
1.3	Azimuth axis	Gear Box	DYNABOX EXPERT, Girard Transmissions 75M60CRU1, No: 1168123403/01 (Lubricate	Type: d by Mobil)	
1.4		Limit Switch	<ul> <li>Telemecanique XCE102C, IEC600947 – 5 – 1</li> <li>GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A, 240V AC 3A DC: 13-22V DC 0.3A IP65 Sam only</li> </ul>	AC: 15- ne Polarity	
1.5		Homing Switch	Telemecanique XCE102C, IEC600947 – 5 – 3 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10A,	AC: 15-	
<b>PROPR</b> proprieta	IETARY NOT	ICE – This material is the of SAC. The contents are	property of Space Applications Centre (ISRO) Ahmeda for confidential use only and are not to be disclosed to a united emproved of Space Applications Centre (ISRO) Al	bad and contains ny others in any	



इसरो	- 570	Indian Sp Ał	ace Research Organisation imedabad – 380015	Document Ver 1.4
Sr No	Axis Details	Part	Detailed Specification	
1.01	Decima		240V AC 3A DC: 13-22V DC 0.3A IP65 Sam	e Polarity
1.6		Bearing	only SKE make bearing SKE \$16 dia	
1.7		Panel Connector	MS3474W16-26S	
1./		Connector for end-	M\$2476W16.26P	
1.0		1	M35470W10-201	
1.9		Connector for end-	MS3476W16-26P	
1.10	1	Brake	Electromechanical Brakes, sure stop Matrix In	ternational
2.1	Motor	Permanent Magnet DC Servomotor, Type: YY0Y3-225, Sr No: 211129532, Tacho 7.0V 115 Vdc 11.3 Adc 3000 rpm. Callan Technolo	M4-2952A- 4.07Nm gy Make	
2.2		Encoder	BTH Incremental Rotary Encoder, Model: BI- L5, Supply: 5V DC Line Driver 2000 PPR	38H8-2000-
2.3 2.4 Elevation axis 2.5		Gear Box	DYNABOX EXPERT, Girard Transmiss 75M60CRU1, No: 1168123403/01 (Lubricated	ions Type: d by Mobil)
	Limit Switch	Telemecanique XCE102C, IEC600947 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10 240V AC 3A DC: 13-22V DC 0.3A IP65 Sa	- 5 - 1 A, AC: 15- ame Polarity	
	Elevation axis	Homing Switch	only         CE102C,         IEC600947         -           GB/T140485,         Ui:         300V         Uimp:         4KV         Ith:         10           240V         AC 3A DC:         13-22V         DC 0.3A         IP65         Sa           only         V	- 5 - 1 A, AC: 15- ame Polarity
2.6	-	Bearing	SKF make bearing SKF 414 dia external teeth	
2.7		Panel Connector	MS3474W16-26S	
2.8		Connector for end- 1	MS3476W16-26P	
2.9		Connector for end- 2	MS3476W16-26P	
2.10		Brake	Electromechanical Brakes, sure stop Matrix In	ternational
3.1		Motor	Permanent Magnet DC Servomotor, Type: YY0Y3-225, Sr No: 211129529, Tacho 7.0V 115 Vdc 11.3 Adc 3000 rpm, Callan Technolo	M4-2952A- 4.07Nm gy make
3.2	Polarization	Encoder	FENAC, FNC 58B 10630V5000-R5, PPR = 2 5-30V dc, Sr No: 86904L21AC018, Turkish N	2000 VCC - Iade
3.3	axis	Gear Box	DYNABOX EXPERT, Girard Transmiss 90E90CH2F, No: 1061000068102/01, (Lu Mobil)	ions Type: bricated by
3.4		Limit Switch	Telemecanique XCE102C, IEC600947 GB/T140485, Ui: 300V Uimp: 4KV Ith: 10	- 5 - 1 A, AC: 15-
3.4 OPRI prieta nner, i	ETARY NOTIO ry information of n whole or in par	Gear Box Limit Switch CE – This material is the SAC. The contents are f t, except with the express	Mobil) Telemecanique XCE102C, IEC600947 - GB/T140485, Ui: 300V Uimp: 4KV Ith: 10 property of Space Applications Centre (ISRO) Ahmedat or confidential use only and are not to be disclosed to an written approval of Space Applications Centre (ISRO) Ah	- 5 - 1 IA, AC: 15- bad and contains ny others in any imedabad 17



इसरो डान्च	Space Indian Spa Ah	e Applications Centre ace Research Organisation imedabad – 380015	RFP Document Ver 1.4
Sr A No. D	Axis Petails Part	Detailed Specification	
Sr         2           No.         D           3.5         3.6           3.7         3.8           3.9         3.10           4.1         4.2           4.3         4.4           L         Slid           4.4         L           5.1         5.1           5.2         5.3           5.4         PROPRIETAF           PROPRIETAF         proprietary info           manner, in whole         Model	Aus betails Part Homing Switch Bearing Panel Connector Connector for end- 1 Connector for end- 2 Brake Motor Encoder Gear Box Limit Switch Limit Switch Limit Switch LM Guide ways Ball Screw Panel Connector Connector for end- 1 Connector for end- 1 Connector for end- 2 Srease For bearing Electrical wiring Timing Belts Lubrication system	Detailed Specification           240V AC 3A DC: 13-22V DC 0.3A IP65 Satonly           Telemecanique XCE102C, IEC600947 –           GB/T140485, Ui: 300V Uimp: 4KV Ith: 10, 240V AC 3A DC: 13-22V DC 0.3A IP65 Satonly           SKF make bearing SKF 544 dia internal teeth           MS3476W16-26P           Electromechanical Brakes, sure stop Matrix Int           Permanent Magnet DC Servomotor, Type: 1           YY0Y3-225, Sr No: 211129530, Tacho 7.0V 4           115 Vdc 11.3 Adc 3000 rpm, Callan Technolog           FENAC, FNC 58B 10630V5000-R5, PPR – 5           5-30V dc, Sr No: 86919J21NA450, Turkish Mi           DYNABOX EXPERT, Girard Transmissi           S0E80CH1F, No: 1061000068101/01, (Lub           Mobil)           Telemecanique XCE102C, IEC600947 –           GB/T140485, Ui: 300V Uimp: 4KV Ith: 10, 240V AC 3A DC: 13-22V DC 0.3A IP65 Satonly           Telemecanique XCE102C, IEC600947 –           GB/T140485, Ui: 300V Uimp: 4KV Ith: 10, 240V AC 3A DC: 13-22V DC 0.3A IP65 Satonly           LM Hiwin Guideways & Blocks HR45           PMI 25 x 1000 mm           MS3476W16-26P           Kubler           Schneider           Fenner make           cenlub	ame Polarity - 5 - 1 DA, AC: 15- ame Polarity ternational M4-2952A- 4.07Nm gy make 5000 VCC - fade ions Type: bricated by - 5 - 1 DA, AC: 15- ame Polarity - 5 - 1 DA



इसरो	 isra	Spa Indian Sp A	ce Applications Centre pace Research Organisation hmedabad – 380015	RFP Document Ver 1.4	
Sr	Axis	Part	Detailed Specification	er –	
No.	Details	DC Same Drive	100 volt 30 ampere, ADVANCED Motion Co	ntrols	
1.1	-	DC Servo Drive	Part No. AB30A2001 - X	ED1226	
1.2	Azimuth	SMPS	1LD00	EP1550-	
1.3		Remote IO	Selector Card 8-16 Beckhoff Make Part No. X	B6cd226B	
1.4	axis	Bias Control	Balluff Switch with relay (for Limits) Remote I/o Beckhoff 40 input 24 output Part 1	No. RIO-	
1.5		Remote IO	PM-00E (Ethercat Remote IO)		
1.6	1	Panel Connector	Amphenol Make MS3474W16-26S		
2.1		DC Servo Drive	100 volt 30 ampere, ADVANCED Motion Co Part No. AB30A200I - X	ntrols	
2.2		SMPS	Siemens make 50 Amp 90 volt DC Part No. 61	EP1336-	
2.3	Elevation	Remote IO	Selector Card 8-16 Beckhoff Make Part No. X	B6cd226B	
2.4	axis	Bias Control	Balluff Switch with relay (for Limits)		
2.5		Remote IO	PM-00E (Ethercat Remote IO)	NO. KIU-	
2.6		Panel Connector	Amphenol Make MS3474W16-26S		
3.1		DC Servo Drive	100 volt 30 ampere, ADVANCED Motion Co Part No. AB30A200I - X	ntrols	
3.2	Polarization axis	SMPS	Siemens make 50 Amp 90 volt DC Part No. 60 1LD00	EP1336-	
3.3		Remote IO	Selector Card 8-16 Beckhoff Make Part No. X	B6cd226B	
3.5	azis	Remote IO	Remote I/o Beckhoff 40 input 24 output Part 1 PM-00E (Ethercat Remote IO)	No. RIO-	
3.6		Panel Connector	Amphenol Make MS3474W16-26S		
		Dec .	100 volt 30 ampere, ADVANCED Motion Co	ntrols	
4.1		DC Servo Drive	Part No. AB30A200I - X		
4.2		SMPS	Siemens make 50 Amp 90 volt DC Part No. 61 1LD00	EP1336-	
4.3	Linear	Remote IO	Selector Card 8-16 Beckhoff Make Part No. X	B6cd226B	
4.4	Slide-axis	Bias Control	Balluff Switch with relay (for Limits)	L BIO	
4.5		Remote IO	PM-00E (Ethercat Remote IO)	vo. RIO-	
4.6	1	Panel Connector	Amphenol Make MS3474W16-26S		
PROPR propriet manner,	IETARY NOTION ary information of in whole or in par	CE – This material is the SAC. The contents are t, except with the express	e property of Space Applications Centre (ISRO) Ahmeda for confidential use only and are not to be disclosed to a s written approval of Space Applications Centre (ISRO) Al	bad and contains ny others in any hmedabad	



RFP Space Applications Centre इसरो डान Indian Space Research Organisation Document Ahmedabad - 380015 Ver 1.4 Sr Axis Part **Detailed Specification** Details No. Lenze Make, Fast Switching Module Part No. El21-24-Linear Fast 5.1 0010 Galvanic isolated Switching DIO Beckhoff Make Part No. Ek1101-0090 Remote Bus Station 5.2 Remote IO ID-Switch Siemens Make Control Power Supply 24/12/5 V DC 10 5.3 SMPS Amp 5.4 Siemens Power Filter unit Meanwell for Trigger pulse Other 5.5 Relay Board Brake unit for Servo motor Schneider Electric PM-01 components 5.6 Panel Connector Amphenol MS3102E20-29SW (LCU Interface) of DUT-5.7 Remote IO Beckhoff Make (custom) Encoder Interface unit for E-bus Positioner 5.8 Remote IO Tacho Feedback unit for 0-10 volt analog in El3xxx Motion 5.9 Relay Relay Card Siemens Make 220 volt / 5 Amp Controller 5.10 Power Contactor Schneider Make Part No. Sc10 Power Contactor 5.11 RTOS Linx Make RT License for Motion controller DLL for Ethercat Bus to support various hardware (Custom made 5.12 Driver File by OEM) 5.13 Push Buttons Schneider Make standard Potentiometer 5.14 Tosoku Make Knob 20 PROPRIETARY NOTICE - This material is the property of Space Applications Centre (ISRO) Ahmedabad and contains proprietary information of SAC. The contents are for confidential use only and are not to be disclosed to any others in any manner, in whole or in part, except with the express written approval of Space Applications Centre (ISRO) Ahmedabad 20







Sr.       Type of No.       Type of work       Frequency       Quantum of work/ Scope of work	Str.       Type of work       Frequency       Quantum of work/ Scope of work         1       Breakdown Service visit       as and when required       Service includes: fault diagnosis, functional inspection, dismantling, part replacement, tuning of motion, motion	<u>B</u>	Howev review this rej	wever, contract intenance work of Annexure-I d system. case the spare e charges for the erred spare prior approval fitse. After comp monstrate the tried out again epared by him general, follow eded during Pre • Minor/ we to three d considered • Major/ br (excluding delivery of ver, reasons for ed by SAC offic gard shall entire	India tor should add c. Payment shall i by Contractor fi parts / compon- ne same shall be arts/component for SAC Officia- pletion of maint positioners in ast the particular wing are two cate wentive, repair an ear & tear or con ays (excluding S to be delayed de eakdown Spares g Sundays & publ f items. delay and non-ar- icial in order to r ely under discreti-	Space Applications Centre       RFP         an Space Research Organisation       Document         Ahmedabad – 380015       Ver 1.4         items/spares, which they feel necessary for the said breakdown       be made accordingly if spare parts / components are replaced from room their stock during Breakdown / Preventive maintenance of the         ents are to be replaced which are not in the list of Annexure-I, paid at actual by SAC. In addition, category in which the above-will fall, be decided by the SAC official. Contractor shall take the / Division Head / General Manager / Group Director in such enance / service work service person of the contractor has to working condition for breakdown maintenance work he has r breakdown calls and provide the maintenance / service report         egories of spares (as indicated in the List of Annexure-I) may be nd Breakdown maintenance work of the machines:         sumable spares: Spares of this category should be arranged in two Sundays & public holidays) beyond this time limit it should be elivery of items.         : Spares of this category should be arranged in ten to twelve days the holidays) beyond this time limit it should be considered delayed         vailability of the spares and its genuineness of the situation will be ationalize the above said terms, case to case. However, decision in on of SAC official and final, Vendor should abide to the same.         e/service/repair       work service person of the contractor has to	
	1     Breakdown Service visit     as and when required     Service includes: fault diagnosis, functional inspection, dismantling, part replacement, tuning of motion, motion verification, assembly and final test		den pro the Follow mainte Scanne Scanne	nonstrate the p paid by him. H n the vendor sh ring table have nance, prevent ers installed at 1 Type of work	positioner in ful owever, please n nould carry out ca e the detailed so tive maintenance NFTR/SAC. Frequency	l working condition and provide the maintenance/service report ote that if subsequent to above work, calibration work is felt needed alibration work to validate the positioning system. tope of work related to every activity to finish the breakdown , repair maintenance and calibration of DUT Positioner and T - Quantum of work/ Scope of work	



इमगे	 isro	Indi	Space Applications Centre an Space Research Organisation Ahmedabad – 380015	RFP Document Ver 1.4
Sr. No.	Type of work	Frequency	Quantum of work/ Scope of wor	k
	Calibration visit	Once in a year or as and when required	Laser alignment activity includes instrument support staff Tuning of motion if required	and technical
3	Preventive maintenance visit	Max. Four times in year as and when required	Service includes: functional inspection, cleaning parts, greasing and oiling, verification of electri wiring, change the oil seals, Complete visual positioner, full motion verification with full lo condition	g of mechanical cal and control l inspection of ad and no load
4	Spare Parts	as and when required	Identify the spare requirement, procurement and same to SAC	d supply of the
5	Logistic Support	as and when required	Decide the suitable equipment and arrange the s	ame at SAC.
Prior he na of iter	calls through <b>approval:</b> Co mes with mob ns carrying by	telephone / e-mail ontractor will have ile number or othe them into the SA	I fax, excluding the day of communication from S e to inform & take prior approval from the SAC er er personal required details of visiting service eng C campus.	SAC officials. official regarding ineers and details
Prior he na of iter	calls through approval: Co mes with mob ns carrying by	telephone / e-mail ontractor will have ile number or othe them into the SA	I / fax, excluding the day of communication from S e to inform & take prior approval from the SAC e er personal required details of visiting service eng C campus.	SAC officials. official regarding ineers and details



इसरो डिन्ठ	Space Applications Centre Indian Space Research Organisation Ahmedabad – 380015	RFP Document Ver 1.4
6. Paymen	t Terms:	
6.1 Payment of V Payment will be n /Repair work; it w duplicate duly ce Completion Vouc shall be submitte service contract n satisfactory Job C Dy. Head/Head of	<b>"isit Charges for Breakdown / Preventive / Calibration / Re</b> nade on successful completion of each Preventive work and for rill be paid after successful completion, testing and validation a riffied by the user and approved by Dy. Head/Head of the 1 her (JCV), to the effect that the positioner / system is maintained d to Accounts Officer, Bills, SAC for releasing payment. Sin to MIRVs will be issued for payment of service charges but 1 completion Voucher (JCV) with contractor's invoice to Account f the Division.	pair work – Calibration /Breakdown activities. The invoice in Division along with Job I/ serviced satisfactorily, ce this is a maintenance End User has to provide nts with the approval of
<b>6.2 Payment for</b> Spares / compone shall be replaced will be made base Division, that the property.	Supply of Spares and Consumables – nts / consumables to be required at the time of servicing / maint with prior approval from the SAC Engineer / Division Head/ G ed on original invoice along with the end user certificate duly e charges of the spares are reasonable. The worn out / retrie	enance of the positioner, Group Director. Payment approved by Head of the aved parts shall be SAC
6.3 Payment for Contractor may ta items fitted in th Division Head/ C Contractor would replaced during r assembly of the re condition. Submi Division that the	Repairing of Positioner Components at Contractors Premis- lake defective positioner components, electronics cards, motors e Positioner to their premises after prior approval from con- Group Director for repairing and charges for the same will submit the estimated repair charges indicating warranty of epairing before starting the repairing work of such parts. Pay epaired parts/spares with the positioner and demonstration of p ssion of invoices along with the end user certificate duly ap repairing charges are reasonable is necessary.	ses – s, timers, drive and other icerned SAC Engineer / be paid extra by SAC. such repaired/new parts ment will be made after ositioner in full working pproved by Head of the
It is responsibility safely return to SA	of Contractor to arrange the collection of defective items for r AC free of charge.	epairing from SAC and
6.4 Penalty of by the contractor service engineer v communication, p complaint.	f Rupees 5% of total visit charges per visit shall be deducted in beyond 72 hours, excluding the day of communication from S. isit to SAC Ahmadabad. If the total delay in response is beyon enalty of 10% of the visit charges shall be deducted for relevan	case of delay in response AC officials, seeking the d Five days from date of at visit for that particular
Penalty of Rupees specified time lim	5% of basic cost of the spare shall be deducted in case of dela it as categorized in section 3.5 & tabulated in Annexure-I.	y in delivery beyond the
Penalty of Rupees offer the system remedial action. T	5 10% of visit charges shall be deducted in case of event, where in full operational condition within 14 days from the receipt This 14 days duration, will include repairing work at vendors far	e contractor is not able to of written proposal for cility/factory and testing
<b>PROPRIETARY</b> No proprietary informati manner, in whole or i	OTICE – This material is the property of Space Applications Centre (ISR on of SAC. The contents are for confidential use only and are not to be d n part, except with the express written approval of Space Applications Cent	CO) Ahmedabad and contains isclosed to any others in any re (ISRO) Ahmedabad <b>25</b>









	इसरो जिल्ह	Space Applications Centre Indian Space Research Organisation Ahmedabad – 380015	RFP Document Ver 1.4
29	<ol> <li>Hydra         <ol> <li>Vendo</li> <li>Form                 inspec</li> <li>Drivin                 22. SAC v                      assem                      23. Utmo:                      of nei                             24. Gener</li></ol></li></ol>	operator must have accompanied with trained rigger. or should carry valid RTO documents for Hydra and other automobile mounted lift 10 with dates of validity, ensuring safety inspection of equipment including of tion carried out at the time of issuance of Form 10. Ig license and training validity certificate of Hydra operator. will not be responsible for injury to vendor's personnel during material handling, bly or any other work. at care should be taken by your service persons while carrying out the job and en ghbouring instrument or whatsoever of SAC property. ally, the maintenance work will be carried out during normal working days (i ) between 9.30 to 18.00 hours, unless otherwise mutually agreed upon to so ale. <b>LLECTUAL PROPERTY RIGHTS &amp; CONFIDENTIALITY:</b> The Contractor cal information, reports and other related documents given by SAC during the con y purpose other than for carrying out the work under Contract to be finalized und <b>ERAGE / RISK OF THE DEPLOYED SENVICE PERSONS:</b> Contractor is fit as aftry of his service persons deployed at SAC. The contractor will be entirely he e of any accident, which leads to nimor or major physical injury and loss of life or the time of execution of contract at our premises due to natural calamities / acci any. s not responsible for any kind of accident to the persons deployed by contractor an seen made to provide any financial assistance / any kind of compensation or c ction with such kind of micidence. <b>IRITY:</b> Contractor shall produce the identity certificate / card which reveals the de personnel deployed, his date of birth, etc. with duly signed by the person deploye ver, contractor should be ready for any other formalties, which may be required ity of the SAC at the time of finalization of contract and it should be complied. <b>TRATION:</b> Dispute, if any, shall be setted mutually, failing which it shall be ref verticator appointed by the Director, SAC Ahmedabad in accordance with Arbitras decision shall be final and binding on both the par	ing equipment. letail report of , dis-assembly, asure the safety i.e. Monday to me other time or shall not use rse of his work er this RFP. Illy responsible eld responsible eld responsible eld responsible eld responsible eld responsible fais personnel dent explosion ost incurred in etails like name d for the work. I by competent ferred to a one- ttion Act 1996, reed the lowest y of the agreed h to any other a and the rates e inspection 29



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Sr. No	Type of work	Frequency	Quantum of work/ Scope of work	Unit Price valid up to 3 Years	Re	<u>marks</u>
1	Breakdown Service visit	as and when require	Service charges per day (including required person for fault diagnosis, functional inspection, dismantling, part replacement, tuning of motion, motion verification, assembly and final test) (Definition of unit = per days)		Definit Price Though the no. will be c breakdo will be do by SAC	ion of Unit <u>x per day</u> it is per day, of days that onsumed for wwn service, secided jointly and Vendor
2	Calibration visit	Max. Once in a year (as and when require)	Service charges includes functional inspection laser alignment activity charges includes instrument and support staff tuning of motion charges if required		Definit Price Service calibrat two dz quoted as price a consider price for	ion of Unit : per visit charges for ion visit for ays will be s a lump sum und will be red as a unit that activity
3	Preventive maintenance visit	Need based (minimum 02 days per visit)	Service charges for two days (including required person for functional inspection, tuning of motion, cleaning of mechanical parts, greasing and oiling, verification of electrical and control wiring, change the oil seals, timing belt tension verification, Complete visual inspection of positioner, full motion verification with and without load)		Definit Price Service pre mainten: two da quoted as price a consider price for	ion of Unit : per visit charges for ventive ance visit for ays will be is a lump sum ind will be red as a unit that activity.
4	Logistic Support	as and when require	Crane with operator 12 - 14 Ton Capacity Forklift with 2 Ton Load Capacity Forklift with 5 Ton Load Capacity Forklift with 10 Ton Load Capacity Lifting Tripod upto 1000 Kg load capacity with Laborer Shifting of any part to vendor premises (without FIM) - required truck upto 25 feet - open		<u>Definit</u> price: 24 <u>Logist</u> <u>avail</u> <u>NF</u> 7	ion of Unit 4 hours from is support ability at IR/SAC
<b>PROF</b> propri manne	PRIETARY NO etary information er, in whole or in j	TICE – This m 1 of SAC. The c part, except with	aterial is the property of Space Application contents are for confidential use only and a the express written approval of Space Appl	s Centre (ISRC re not to be dis ications Centre	)) Ahmedab closed to a (ISRO) Ah	ad and contains ny others in any medabad <b>30</b>



हमरे		Space Applications Centre Indian Space Research Organisation Ahmedabad – 380015	RFP Document Ver 1.4	
Spar	e Part List –			
Sr No.	Devices	Detailed specification	Unit Price valid up to 3 Years	Spare/item category
1	Motor	Callan Make Permanent Magnet DC Servomotor, Type: M4-2952A-YY0Y3-225 with Tacho		Major
2	Motor	Callan Make Permanent Magnet DC Servomotor Type: M4-2006D-YY001-142 with Tacho		Major
3	Encoder	FENAC Make FNC 58B 10630V5000-R5, PPR - 5000		Major
4	Encoder	BTH Make Incremental Rotary Encoder Model: BI-38H8-2000-L5		Major
5	Encoder	Autonics Make Rotary Incremental Encoder Model: E4056-2000-6-L-5		Major
6	Gear box	DYNABOX EXPERT Make Girard Transmissions Type: 75E3UCH2F		Major
7	Gear box	DYNABOX EXPERT Make Girard Transmissions Type: 45E30CH2E		Major
8	Gear box	DYNABOX EXPERT Make Girard Transmissions Type: 75M60CRU1		Major
9	Gear box	DYNABOX EXPERT Make Girard Transmissions Type: 90F90CH2F		Major
10	Gear box	DYNABOX EXPERT Make		Major
11	DC Servo Drive	ADVANCED Motion Controls Part No. AB30A2001 - X		Major
12	Remote IO	Selector Card 8-16 Beckhoff Make Part No. XB6cd226B		Major
13	Remote IO	Remote I/o Beckhoff 40 input 24 output Part No. RIO-PM-00E (Ethercat Remote IO)		Major
14	Linear Fast Switching DIO	Lenze Make Fast Switching Module Part No. El21-24-0010 Galvanic isolated		Major
15	Remote IO	Beckhoff Make Part No. Ek1101-0090 Remote Bus Station ID-Switch		Major
16	Relay Board	Brake unit for Servo motor Schneider Electric PM-01		Major
<b>PROP</b> proprie manne	RIETARY NOTI tary information o r, in whole or in pa	CE – This material is the property of Space Application f SAC. The contents are for confidential use only and a rt, except with the express written approval of Space Appl	s Centre (ISRO) Ahms re not to be disclosed t ications Centre (ISRO)	dabad and contains o any others in any Ahmedabad 31


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	Sr No.	Devices	Detailed specification	Unit Price valid up to 3 Years	Spare/item category
	17	Remote IO	Beckhoff Make (custom) Encoder Interface unit for E-bus		Major
	18	Remote IO	Tacho Feedback unit for 0-10 volt analog in El3xxx		Major
	19	RTOS	Linx Make RT License for Motion controller		Major
	20	Driver File	DLL for Ethercat Bus to support various hardware (Custom made by OEM)		Major
	21	Limit Switch	Telemecanique Make XCE102C, IEC600947 – 5 – 1, Same Polarity only		Minor
	22	Homing Switch	Telemecanique XCE102C, IEC600947 – 5 – 1, Same Polarity only		Minor
	23	Panel connector	Amphenol Aero MS3474W16-26S		Minor
	24	Connector for end-1	Amphenol Aero MS3476W16-26P		Minor
	25	Connector for end-2	Amphenol Aero MS3476W16-26P		Minor
	26	Ball Screw	C3 Precision Make ground Pitch 5mm & Diameter 30 mm		Minor
	27	SMPS	Siemens Make 50 Amp 90 volt DC Part No. 6EP1336-1LD00		Minor
	28	Bias Control Panel	Balluff Switch with relay (for Limits)		Minor
	29	Connector	Siemens Make		Millor
	30	SMPS	Control Power Supply 24/12/5 V DC 10 Amp		Minor
	32	Panel	Amphenol Aero MS3102E20-29SW (LCU Interface)		Minor
	33	Relay	Relay Card Sigmens Make 220 volt / 5 Amp		Minor
	34	Power Contactor	Schneider Make Part No. Sc10 Power Contactor		Minor
	35	Push Buttons	Schneider Make standard		Minor
	36	Potentiometer Knob	Takushi Make		Minor
	37	LM Guideways			Minor
	38	Rack & Pinion			Minor
	39	Slewing Bearing			Minor
1	PROP proprie manne	RIETARY NOTI tary information o r, in whole or in par	CE - This material is the property of Space Applications C f SAC. The contents are for confidential use only and are r tt, except with the express written approval of Space Applica	Centre (ISRO) Ahme not to be disclosed t ttions Centre (ISRO)	dabad and contains o any others in any Ahmedabad <b>32</b>







## Space Applications Centre Indian Space Research Organisation Ahmedabad – 380015

	इसरो डान	0	Space Applications Centre Indian Space Research Organisation Ahmedabad – 380015	RFP Document Ver 1.4
	29		Oiling of Reduction Gear Boxes	
	30		Verification of movement in forward (CW) direction	
	31		Verification of movement in reverse (CCW)	
	32	DUT -	Limit to limit movement of polarization axis	
	52	Polarization	rotation in both direction	
	33	Axis	Movement verification with fine speed selection	
	34		Movement verification with Coarse speed selection	
	35		Functional Verification of Electromechanical brakes	
	36		Greasing of Slewing Bearing	
	37		Oiling of Reduction Gear Boxes	
	38		Visual inspection of FEED Positioner	
	39	T-Scanner	Check Timing belt tension of all axes and adjust if required	
	40		Check control cable connections. Clean and secure connectors and cables	
	41	T-Scanner	Visual inspection of T-Scanner Controller	
	42	Controller	Check exterior and interior of motion controller.	
	42		Adjustment / Tuning of axis motion through	
	43		optimizing the PID parameter in control software	
	44		Verification of movement in forward (+) direction	
	45		Verification of movement in reverse (-) direction	
	46	T Seemer	Limit to limit movement of linear slide axis in both	
	40	- Jinear Slide	direction	
	47	- Linear Sinde X-avis	Movement verification with fine speed selection	
	48	22-0.215	Movement verification with Coarse speed selection	
	48		Greasing of Linear Bearings/ Lm Guides	
	49		Greasing of Rack & Pinion	
	50		Verification of movement in forward (+) direction	
	51		Verification of movement in reverse (-) direction	
1	52	T-Scanner	Limit to limit movement of linear slide axis in both	
	52	– Linear Slide	direction	
	54	Y-axis	Movement verification with Cases aread selection	
	55		Grassing of Linear Bearings/Im Cuides	<u> </u>
	56		Greasing of Linear Dearings, Lin Guides	
	57		Verification of movement in forward (+) direction	<u> </u>
	58		Verification of movement in reverse (-) direction	
		T-Scanner	Limit to limit movement of azimuth axis rotation in	
	59	<ul> <li>Linear Slide</li> </ul>	both direction	
	60	Z-axis	Movement verification with fine speed selection	
	61		Movement verification with Coarse speed selection	
	61 PROPRIET proprietary manner, in v	TARY NOTICE - information of SA( whole or in part, exc	Movement verification with Coarse speed selection This material is the property of Space Applications Centre (ISRO) Ahr C. The contents are for confidential use only and are not to be disclosed cept with the express written approval of Space Applications Centre (ISRO)	nedabad and contains 1 to any others in any D) Ahmedabad 35

Specific remark       Specific remark       Specific remark         0 Specific remark       Specific remark       Specific remark         1 Specific remark       Specific remark       Specific remark	इसरो वन्नह		Space Applications Centre Indian Space Research Organisation Ahmedabad – 380015		RFP Document Ver 1.4
	36	62         63         64         65         66         70         Any Specific remark related to DUT Positioner         Any Specific remark related to DUT Positioner         Any Specific remark related to T-Scanner         Functional Inspection Point         Remarks by NFTR - SA         SAC Engineer Present E         Remarks by NFTR Inch         NFTR Incharge Signatu         PROPRIETARY NOTICE - proprietary information of SA4 manner, in whole or in part, exc	Ahmedabad – 380015         Space Applications Centre Indian Space Research Organisation Ahmedabad – 380015         Greasing of Slewing Bearing Oiling of Reduction Gear Boxes         Verification of movement in forward (CW) direction         Use of the second	RFP         Document         Ver 1.4	Ver 1.4









## Space Applications Centre Indian Space Research Organisation Ahmedabad – 380015

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28       Greasing of Slewing Bearing       1         30       Oiling of Reduction Gear Boxes       1         31       Verification of movement in forward (CW)       1         32       DUT -       Timit to limit movement in forward (CW)       1         33       Polarization       Movement verification with Carse speed       1         34       Axis       Movement verification with Carse speed       1         36       Greasing of Slewing Bearing       1       1         37       Oiling of Reduction Gear Boxes       1       1         36       Greasing of Slewing Bearing       1       1         37       Oiling of Reduction Gear Boxes       1       1         38       Uvisual Impection of FED Positioner       1       1         39       T-Scamer       Check Control cable connections. Clean and secure connectors and cables.       1         40       Check control cable connections. Clean and secure connectors and cables.       1       1         41       T-Scamer       Check control cable connections. Clean and secure connectors and cables.       1         42       T-Scamer       Check control cable connections. Clean and secure connectors and cables.       1         43       Verification of movement in forward (-) direction			इसरी डिन	-	Ahmedabad – 380015		Ver 1.4	
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10       direction       direction         31       Verification of movement in reverse (CCW)       direction         32       PUT -       Polarization       Movement verification with Gares speed         34       Axis       Boundary Station       Movement verification of Electromechanical         35       Fouriand Verification of Electromechanical       Boundary Station         36       Greasing of Slaving Bearing       Oiling of Reduction Gear Boxes         37       Oiling of Reduction Of FEED Positioner       Diversity of Carbon of FEED Positioner         39       T-Scamer       Check Timing belt Insuito of all Axes and adjust if required         40       Controller       Check exterior and interior of motion controller.         43       Controller       Check exterior and interior of motion controller.         44       Verification of movement in reverse (- Oil nection       Imit to limit movement of linear slide axis in both direction         44       Verification of movement in reverse (- Oil nection       Imit to limit movement of linear slide axis in both direction         45       Verification of movement in forward (+) direction       Imit to limit movement of linears slide axis in both direction         50       Verification of movement in forward (+) direction       Imit to limit movement of linears slide axis in both direction         51			30		Verification of movement in forward (CW)			
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32       DUT – Polarization       Limit to limit movement of polarization axis rotation in both direction         34       Axis       Movement verification with fine speed selection         35       Functional Verification of Electromechanical brakes         36       Greasing of Slewing Bearing         37       Oiling of Reduction Gear Boxes         38       Visual inspection of FEED Positioner         40       Check Timing belt tension of all axes and adjust if required         41       T-Scamer         43       Outling of X-statusent/ Tuming of Axis motion through optimizing the PID parameter in control software         43       Verification of movement in forward (-) direction         44       Verification of movement in forward (-) direction         45       Movement verification with fine speed selection         46       T-Scamer         47       - Linear Slide         48       Werification of movement in forward (-) direction         48       Greasing of Linear Bearings/ Lin Guides         49       Verification of movement in forward (-) direction         50       T-Scamer       Movement verification with Coarse speed selection         51       Linear Slide       Movement verification with Coarse speed selection         52       T-Scamer       Movement verification with			31		direction			
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33       Polarization       Movement verification with Carse speed         34       Axis       Movement verification with Carse speed         35       Functional Verification of Electromechanical         36       Greasing of Slewing Bearing         37       Oiling of Reduction Gear Boxes         38       Visual inspection of FEED Positioner         40       Check Timing belt tension of all axes and adjust if         40       Check Control cable connections. Clean and secure         41       T-Scamer         42       T-Scamer         43       Outling of X structure in control software         44       Visual inspection of T-Scamer Controller         45       Visual inspection of T-Scamer Controller         46       Controller of movement in forward (+) direction         47       - Lineer Slide         48       Verification of movement in forward (+) direction         48       Movement verification with Coarse speed         49       Greasing of Linear Bearings/ Lin Guides         49       Greasing of Mack & Pinion         50       Verification of movement in reverse (-) direction         51       Limit to limit movement of linear slide axis in both         52       T-Scammer       Greasing of Linear Bearings/ Lin Guides			32		rotation in both direction			
34       Interview Control and Control speed         35       Functional Verification of Electromechanical brakes         36       Greasing of Slewing Bearing         37       Oiling of Reduction Gear Boxes         38       Visual inspection of FEED Positioner         40       Check Ciming belt tension of all axes and adjust if         40       Check control cable connections. Clean and secure connectors and cables.         41       T-Scamer         42       T-Scamer         43       Outfold System? / Tuning of axis motion through optimizing the PID parameter in control software         44       Verification of movement in forward (+) direction         44       Verification of movement in forward (+) direction         45       Verification of movement in forward (+) direction         46       T-Scamer         47       - Limear Slide         48       Greasing of Linear Bearings/ Lin Guides         49       Greasing of Linear Bearings/ Lin Guides         51       Verification of movement in reverse (-) direction         52       T-Scamer         53       - Linear Slide         54       Y-axis         55       Greasing of Linear Bearings/ Lin Guides         56       T-Scamer       Movement verification with Coa			35		Movement verification with fine speed selection Movement verification with Coarse speed			
35       Functional Verification of Electromechanical brakes         36       Greasing of Slewing Bearing         37       Oiling of Reduction Gear Boxes         38       Visual inspection of FEED Positioner         39       T-Scamer         40       Check control cable connections. Clean and secure connectors and cables.         41       Visual inspection of T-Scamer Controller         42       T-Scamer         43       Outload Controller         44       Verification of movement in forward (+) direction         45       Verification of movement in forward (-) direction         46       T-Scamer         47       - Linear Slide         48       Greasing of Linear Bearings/ Lin Guides         49       Greasing of Rack & Pinion         50       Verification of movement in forward (+) direction         48       Verification of movement in forward (+) direction         51       Verification of movement in forward (+) direction         52       T-Scamer         53       - Linear Slide         49       Greasing of Linear Bearings/ Lin Guides         52       T-Scamer         53       - Linear Slide         54       Y-axis         56       Greasing of Rac			34	1 1.110	selection			
36       Greasing of Slewing Bearing       Image: Seasing of Slewing Bearing         38       Visual inspection of FEED Positioner         39       T-Scamer       Check Control cable connections. Clean and secure connectors and cables.         40       Check control cable connections. Clean and secure connectors and cables.         41       T-Scamer       Visual inspection of T-Scamer Controller         43       Controller       Adjustment / Tuning of axis motion controller.         44       Verification of movement in forward (-) direction       Image: Controller         45       Verification of movement in forward (-) direction       Image: Controller         46       T-Scamer       Movement verification with Coarse speed       Image: Controller         47       - Linear Slide       Movement verification with Coarse speed       Image: Controller       Image: Controller         50       Verification of movement in forward (-) direction       Image: Controller       Image: Controller       Image: Controller         51       T-Scamer       Movement verification with Coarse speed       Image: Controller       Image: Controller       Image: Controller         52       T-Scamer       Verification of movement in forward (-) direction       Image: Controller       Image: Controller       Image: Controller       Image: Controller       Image: Controller </td <td></td> <td></td> <td>35</td> <td></td> <td>Functional Verification of Electromechanical</td> <td></td> <td></td> <td></td>			35		Functional Verification of Electromechanical			
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38       Visual inspection of FEED Positioner         39       T-Scamer         40       Check Timing belt tension of all axes and adjust if         41       Check control cable connections. Clean and secure connectors and cables.         41       Visual inspection of T-Scamer Controller         43       Controller         44       Visual inspection of motion controller.         45       Adjustment / Tuning of axis motion through         46       Verification of movement in forward (+) direction         47       - Linear Slide         48       Verification of movement of linear slide axis in both         48       Verification of movement in forward (+) direction         49       Greasing of Linear Bearings/ Lm Guides         51       T-Scamer         52       T-Scamer         53       - Linear Slide         Movement verification with Grase speed         54       Y-axis         55       Greasing of Linear Bearings/ Lm Guides         54       Y-axis         55       Greasing of Rack & Pinion         56       Greasing of Rack & Pinion         57       T-Scamer         58       - Linear Slide         59       T-Scamer         50			30		Oiling of Reduction Gear Boxes			
39       T-Scamer       Check Timing belt tension of all axes and adjust if required         40       Check control cable connections. Clean and secure connectors and cables.         41       Visual inspection of T-Scamer Controller         42       T-Scamer         43       Controller         44       Visual inspection of T-Scamer Controller.         44       Verification of movement in control software         45       Verification of movement in reverse (.) direction         46       T-Scamer         47       - Linear Slide         48       Wovement verification with fine speed selection         48       Greasing of Linear Bearings/ Lm Guides         49       Greasing of Rack & Pinion         50       Verification of movement in reverse (.) direction         51       Uverification of movement in reverse (.) direction         52       T-Scamer         53       T-Scamer         54       Y-axis         56       Greasing of Linear Bearings/ Lm Guides         56       Greasing of Linear Bearings/ Lm Guides         56       Greasing of Rack & Pinion         57       T-Scamer         58       V-axis         59       T-Scamer         50       G			38		Visual inspection of FEED Positioner			
40       Instant       required         41       Check control cable connections. Clean and secure connectors and cables.       Inspection of T-Scamer Controller         41       Visual inspection of T-Scamer Controller.       Inspection of T-Scamer Controller.         43       Controller       Adjustment / Tuning of axis motion through optimizing the PID parameter in control software         44       Verification of movement in forward (+) direction       Verification of movement in reverse (-) direction         46       T-Scamer       Insection of Incovement in forward (+) direction         48       X-axis       Movement verification with fine speed selection         48       Greasing of Linear Bearings/ Lm Guides       Insection         50       Verification of movement in forward (+) direction       Verification of movement in reverse (-) direction         51       T-Scamer       Urefication of movement of linear slide axis in both direction       Insection         52       T-Scamer       Greasing of Linear Bearings/ Lm Guides       Greasing of Linear Bearings/ Lm Guides         53       - Linear Slide       Movement verification with fine speed selection       Insection         53       - Linear Slide       Movement verification with Goarse speed selection       Insection         54       Y-axis       Greasing of Linear Bearings/ Lm Guides       Greasin			39	TSamuer	Check Timing belt tension of all axes and adjust if			
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41       T-Scamer       Visual inspection of T-Scamer Controller         43       Controller       Check exterior and interior of motion controller.         43       Controller       Adjustment / Tuming of axis motion through optimizing the PID parameter in control software         44       Verification of movement in forward (+) direction       Image: Controller         45       Verification of movement in reverse (-) direction       Image: Controller         46       T-Scamer       Verification of movement of linear slide axis in both direction       Image: Controller         47       - Linear Slide       Movement verification with fine speed selection       Image: Controller         48       Greasing of Linear Bearings/ Lm Guides       Image: Controller       Image: Controller         50       Verification of movement in forward (+) direction       Image: Controller       Image: Controller         51       Greasing of Rack & Pinion       Image: Controller       Image: Controller       Image: Controller         52       T-Scamer       Movement verification with fine speed selection       Image: Controller       Image: Controller         53       - Linear Slide       Movement verification with Coarse speed       Selection       Image: Controller         54       Y-axis       Greasing of Rack & Pinion       Image: Controler       Image: Co			40		connectors and cables.			
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45       Verification of movement in reverse (-) direction         46       T-Scamer         47       - Linear Slide         48       X-axis         49       Greasing of Linear Bearings/ Lm Guides         50       Verification of movement in reverse (-) direction         50       Verification of movement in forward (+) direction         51       Verification of movement in reverse (-) direction         52       T-Scamer         53       - Linear Slide         54       Y-axis         56       Greasing of Linear Bearings/ Lm Guides         57       T-Scamer         58       - Linear Slide         77       T-Scamer         78       - Linear Slide         77       T-Scamer         78       - Linear Slide         77       T-Scamer         78       - Linear Slide         76       T-Scamer<			44	T-Scanner – Linear Slide X-axis	Verification of movement in forward (+) direction			
46       T-Scamer       Immit to immit movement of inteer side axis in both         48       Araxis       Immit to immit movement of inteer side axis in both         48       Greasing of Linear Bearings/ Lm Guides         49       Greasing of Rack & Pinion         50       Verification of movement in forward (+) direction         51       Verification of movement in forward (+) direction         52       T-Scamer         53       - Linear Slide         54       Y-axis         55       Greasing of Linear Bearings/ Lm Guides         56       Greasing of Linear Bearings/ Lm Guides         57       T-Scamer         58       - Linear Slide         56       Greasing of Linear Bearings/ Lm Guides         57       T-Scamer         58       - Linear Slide         77       T-Scamer         78       - Linear Slide         74       Verification o			45		Verification of movement in reverse (-) direction			
47       - Linear Slide       Movement verification with fine speed selection         48       Greasing of Linear Bearings/ Lm Guides         49       Greasing of Rack & Pinion         50       Verification of movement in forward (+) direction         51       Verification of movement in reverse (-) direction         52       T-Scanner         53       - Linear Slide         54       Y-axis         55       Greasing of Linear Bearings/ Lm Guides         54       Y-axis         55       Greasing of Linear Bearings/ Lm Guides         56       Greasing of Rack & Pinion         57       T-Scanner         58       - Linear Slide         Verification of movement in forward (+) direction         57       T-Scanner         58       - Linear Slide         Verification of movement in forward (+) direction         58       - Linear Slide         Verification of movement in forward (+) direction         58       - Linear Slide         Verification of movement in reverse (-) direction         58       - Linear Slide         Verification of movement in reverse (-) direction         58       - Linear Slide         Verification of sAC. The contents are for confidential use			46		direction			
48       X-axis       Movement verification with Coarse speed selection         48       Greasing of Linear Bearings/ Lm Guides         49       Greasing of Rack & Pinion         50       Verification of movement in forward (+) direction         51       Limit to limit movement of linear slide axis in both direction         52       T-Scamer         53       - Linear Slide         54       Y-axis         55       Greasing of Linear Bearings/ Lm Guides         56       Greasing of Rack & Pinion         57       T-Scamer         58       - Linear Slide         56       Greasing of Rack & Pinion         57       T-Scamer         58       - Linear Slide         77       T-Scamer         78       - Linear Slide         79       T-Scamer         71       T-Scamer         71       Verification of movement in forward (+) direction         70       T-Scamer         71       T-Scamer         72       T-Scamer         73       T-Inear Slide         74       Verification of movement in forward (+) direction         75       T-Inear Slide         70       T-Scamer			47		Movement verification with fine speed selection			
48       Greasing of Linear Bearings/ Lm Guides         49       Greasing of Rack & Pinion         50       Verification of movement in forward (+) direction         51       Verification of movement in reverse (-) direction         52       T-Scanner         53       - Linear Slide         54       Y-axis         Movement verification with fine speed selection         55       Greasing of Linear Bearings/ Lm Guides         56       Greasing of Linear Bearings/ Lm Guides         57       T-Scanner         58       - Linear Slide         Verification of movement in forward (+) direction         57       T-Scanner         58       - Linear Slide         77       T-Scanner         Verification of movement in forward (+) direction         57       T-Scanner         7       T-Scanner         Verification of movement in forward (+) direction         58       - Linear Slide         Verification of movement in reverse (-) direction         7       T-Scanner         9       Verification of movement in reverse (-) direction         7       T-Scanner         9       - Linear Slide         9       Verification of movement in reverse (-			48		Movement verification with Coarse speed			
interface       Control of Rack & Pinion         40       Greasing of Rack & Pinion         50       Verification of movement in forward (+) direction         51       Limit to limit movement of linear slide axis in both         52       T-Scanner         53       - Linear Slide         54       Y-axis         55       Movement verification with fine speed selection         54       Y-axis         56       Greasing of Linear Bearings/ Lm Guides         56       Greasing of Rack & Pinion         57       T-Scanner         58       – Linear Slide         Verification of movement in forward (+) direction         57       T-Scanner         Verification of movement in forward (+) direction         57       T-Scanner         Verification of movement in forward (-) direction         58       – Linear Slide         Verification of movement in reverse (-) direction         58       – Linear Slide         Verification of sAcc. The contents are for confidential use only and are not to be disclosed to any others in any manner, in whole or in part, except with the express written approval of Space Applications Centre (ISRO) Ahmedabad			48		selection Greasing of Linear Bearings/ I m Guides			
50       Verification of movement in forward (+) direction         51       Verification of movement in reverse (-) direction         52       T-Scanner         53       - Linear Slide         54       Y-axis         55       Movement verification with fine speed selection         55       Greasing of Linear Bearings/ Lm Guides         56       Greasing of Rack & Pinion         57       T-Scanner         58       - Linear Slide         Verification of movement in forward (+) direction         58       - Linear Slide         Verification of movement in forward (+) direction         PROPRIETARY NOTICE - This material is the property of Space Applications Centre (ISRO) Ahmedabad and contains proprietary information of SAC. The contents are for confidential use only and are not to be disclosed to any others in any manner, in whole or in part, except with the express written approval of Space Applications Centre (ISRO) Ahmedabad       40			49		Greasing of Rack & Pinion			
51       Verification of movement in reverse (-) direction         52       T-Scamer         53       - Linear Slide         54       Y-axis         55       Movement verification with fine speed selection         55       Greasing of Linear Bearings/ Lm Guides         56       Greasing of Rack & Pinion         57       T-Scamer         58       - Linear Slide         Verification of movement in reverse (-) direction         9       Verification of movement in forward (+) direction         58       - Linear Slide         Verification of movement in reverse (-) direction         7       T-Scamer         9       Verification of movement in forward (+) direction         58       - Linear Slide         Verification of movement in reverse (-) direction         9       PROPRIETARY NOTICE – This material is the property of Space Applications Centre (ISRO) Ahmedabad and contains proprietary information of SAC. The contents are for confidential use only and are not to be disclosed to any others in any manner, in whole or in part, except with the express written approval of Space Applications Centre (ISRO) Ahmedabad       40			50		Verification of movement in forward (+) direction			
52       T-Scanner         53       - Linear Slide         54       Y-axis         55       Movement verification with fine speed selection         56       Greasing of Linear Bearings/ Lm Guides         57       T-Scanner         58       - Linear Slide         7       T-Scanner         Verification of movement in forward (+) direction         58       - Linear Slide         Verification of movement in reverse (-) direction         7       T-Scanner         Verification of movement in reverse (-) direction         7       T-Scanner         Verification of movement in reverse (-) direction         7       T-Scanner         Verification of movement in reverse (-) direction         7       T-Scanner         Verification of movement in reverse (-) direction         7       T-Scanner         Verification of space Applications Centre (ISRO) Ahmedabad and contains proprietary information of SAC. The contents are for confidential use only and are not to be disclosed to any others in any manner, in whole or in part, except with the express written approval of Space Applications Centre (ISRO) Ahmedabad         40			51		Verification of movement in reverse (-) direction			
53       - Linear Slide       Movement verification with fine speed selection         54       Y-axis       Movement verification with Coarse speed selection         55       Greasing of Linear Bearings/ Lm Guides         56       Greasing of Rack & Pinion         57       T-Scanner         58       - Linear Slide         Verification of movement in forward (+) direction         58       - Linear Slide         Verification of movement in reverse (-) direction         PROPRIETARY NOTICE – This material is the property of Space Applications Centre (ISRO) Ahmedabad and contains proprietary information of SAC. The contents are for confidential use only and are not to be disclosed to any others in any manner, in whole or in part, except with the express written approval of Space Applications Centre (ISRO) Ahmedabad			52	T-Scanner	direction			
54       Y-axis       Movement verification with Coarse speed selection         55       Greasing of Linear Bearings/Lm Guides         56       Greasing of Rack & Pinion         57       T-Scanner         58       - Linear Slide         Verification of movement in forward (+) direction         58       - Linear Slide         Verification of movement in reverse (-) direction         PROPRIETARY NOTICE - This material is the property of Space Applications Centre (ISRO) Ahmedabad and contains proprietary information of SAC. The contents are for confidential use only and are not to be disclosed to any others in any manner, in whole or in part, except with the express written approval of Space Applications Centre (ISRO) Ahmedabad			53	– Linear Slide	Movement verification with fine speed selection			
55       Greasing of Linear Bearings/ Lm Guides         56       Greasing of Rack & Pinion         57       T-Scanner         58       - Linear Slide         Verification of movement in forward (+) direction         58       - Linear Slide         Verification of movement in reverse (-) direction         PROPRIETARY NOTICE – This material is the property of Space Applications Centre (ISRO) Ahmedabad and contains proprietary information of SAC. The contents are for confidential use only and are not to be disclosed to any others in any manner, in whole or in part, except with the express written approval of Space Applications Centre (ISRO) Ahmedabad       40			54	Y-axis	Movement verification with Coarse speed			
Stating of Findar Bearing's Findards         56       Greasing of Rack & Pinion         57       T-Scanner         58       - Linear Slide         Verification of movement in forward (+) direction         58       - Linear Slide         Verification of movement in reverse (-) direction         PROPRIETARY NOTICE – This material is the property of Space Applications Centre (ISRO) Ahmedabad and contains proprietary information of SAC. The contents are for confidential use only and are not to be disclosed to any others in any manner, in whole or in part, except with the express written approval of Space Applications Centre (ISRO) Ahmedabad       40			55		selection Grassing of Linear Bearings/ I m Guides			
57         T-Scanner         Verification of movement in forward (+) direction           58         - Linear Slide         Verification of movement in reverse (-) direction           PROPRIETARY NOTICE - This material is the property of Space Applications Centre (ISRO) Ahmedabad and contains proprietary information of SAC. The contents are for confidential use only and are not to be disclosed to any others in any manner, in whole or in part, except with the express written approval of Space Applications Centre (ISRO) Ahmedabad         40			56		Greasing of Rack & Pinion			
58       - Linear Slide       Verification of movement in reverse (-) direction         PROPRIETARY NOTICE – This material is the property of Space Applications Centre (ISRO) Ahmedabad and contains proprietary information of SAC. The contents are for confidential use only and are not to be disclosed to any others in any manner, in whole or in part, except with the express written approval of Space Applications Centre (ISRO) Ahmedabad         40			57	T-Scanner	Verification of movement in forward (+) direction			
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		1	manner, in	whole or in part, exc	cept with the express written approval of Space Applications Centre	e (ISRO) Ahı	medabad 40	
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<u><u></u></u>		59       Z-axis         60       61         61       62         63       64         65       66         66       T-Scanner         67       - Roll axis         68       69         70       Any Specific remark related to DUT Positioner         Any Specific remark related to T-Scanner         Functional Inspection I         Remarks by NFTR - S.         SAC Engineer Present         Remarks by NFTR Inco         NFTR Incharge Signat	Indian Space Research Organisation Ahmedabad – 380015         Space Applications Centre Indian Space Research Organisation Ahmedabad – 380015         Limit to limit movement of azimuth axis rotation in both direction         Movement verification with fine speed selection         Movement verification with Gears speed selection         Oiling of Slewing Bearing         Oiling of Slewing Bearing         Oiling of Slewing Bearing         Oiling of Reduction Gear Boxes         Verification of movement in reverse (CCW) direction         Limit to limit movement of polarization axis rotation in both direction         Movement verification with fine speed selection         Movement verification with Coarse speed selection         Greasing of Slewing Bearing         Oiling of Reduction Gear Boxes         Verification Gear Boxes         Colling of Reduction Gear Boxes         AC Engineer:	RFP         Document         Ver 1.4	Document Ver 1.4
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