

## COMPACT SIZE, HIGH SPEED WITH LOW BACKLASH SATELLITE ROLLER SCREW MECHANISM FOR DEFENCE AND AEROSPACE SYSTEMS

Defence Research and Development organization at its Research Centre Imarat (RCI), Hyderabad has developed various kinds Satellite Roller Screw Mechanisms. RCI invites expression of interest from the suitable and capable manufacturers having the enriched experience in manufacturing high precision products to undertake the production of state of the art compact systems. The firm should be technologically sound to manufacture and the supply the products with requisite quality standards to meet to the stringent requirements of defence and aerospace applications.

Satellite Roller Screw mechanism or Planetary Roller Screw mechanism is one of important and technologically complex element of the Electro-Mechanical Actuation (EMA) system. They are used as the transmission mechanism for converting rotational motion to linear motion. They are preferred to other mechanisms for their efficiency at high speeds, positioning precision, load rating, rigidity, speed, acceleration, and lifetime.

The capacity to carry heavy loads for the designated application in the most arduous condition makes the satellite Roller Screw suitable for the demanding applications. The symmetric and robust Nut assembly withstands the shock loads and other harsh environmental conditions.



Three variants of developed satellite Roller Screws

### Principle of operation:

The principle of Satellite Roller Screw mechanism is the rotary motion of the motor is converted into linear motion. The main elements of Satellite Roller Screw are the Screw, half nuts, timing gear and the rollers

The lead Screw has multi-start thread with a triangular profile and is coupled to motor assembly housed in housing. The rotary motion of the motor rotates the lead screw which in turn allows the threaded rollers which are assembled in planetary arrangement to roll around the screw. Due to this rotational movement the half nut assembly tends to move linearly.

## Salient features:

- Higher static and dynamic capacities
- Increased rigidity
- Lower axial clearance (Backlash)
- Higher limiting speed
- High efficiency
- Compact size
- Maintenance free and long life

## Specifications of the developed systems:

- Static load capacity : 20 to 32 KN
- Dynamic load capacity : 16 to 27 KN
- Lead accuracy : G3 (0.012 mm /300 mm)
- Stroke : 30 to 45 mm
- Backlash : < 0.03 mm without preload

## Applications:

- Defence / Aerospace

## Infrastructure required:

Essential facilities required for manufacturing, assembly and testing of Satellite Roller Screw.

### Manufacturing:

- 1) High precision CNC internal and external thread grinding machines with capability to make required profile dressing of the wheel and with following specifications
  - a) Positional Accuracy (X Axis)  $\leq 0.005$  mm
  - b) Positional Accuracy (Z Axis)  $\leq 0.005$  mm
  - c) Repeatability (X Axis)  $\leq 0.003$  mm
  - d) Repeatability (Z Axis)  $\leq 0.003$  mm
  - e) Wheel Helix (A Axis) Position Resolution : Programmable to  $0001^\circ$
  - f) Work Head Spindle (C Axis) Resolution  $\leq 0.0014^\circ$
  - g) Wheel Head Slide (X Axis) Position Resolution  $\leq 0.001$  mm
- 2) PVD coating equipment (Sputtering) for Molybdenum disulphide (MoS<sub>2</sub>) / Tungsten Disulphide coating
- 3) Vacuum Heat treatment
- 4) CNC Gear Shaper
- 5) Cylindrical grinding machine for internal and external surfaces.
- 6) Surface grinding machine
- 7) CNC turning / Milling centre / Turn-mill centre

### Metrology equipments:

- 1) Form/ Contour measuring machine
- 2) Progressive pitch error measuring facility (Laser)
- 3) Coordinate measuring machine (CMM)
- 4) Frictional Torque measurement test bench
- 5) Preload cycling equipment
- 6) Electronic Floating carriage micrometer ( $\leq$  Least Count 0.0001mm)

Interested parties may respond along with their company profile, financial status with technical capabilities etc., as per the following format

- 1) Memorandum and Articles of Association (Should be incorporated as per Indian Companies Act, 1956)
- 2) Certificate of registration as a manufacturing unit.
- 3) Balance sheet for preceding three years.
- 4) Income tax returns for proceeding three years period.
- 5) Details of shareholding/ownership pattern especially foreign partners/ shareholders, foreign employees, directors, etc. The company must adhere to the prevailing Govt of India policies and regulations on Foreign Direct Investment (FDI)/DIPP norms as applicable.
- 6) Annual budget for R&D during last three years.
- 7) Number of technically and professionally qualified personnel.
- 8) Numbers and details of IPR or patents, etc., held by the company.
- 9) Record of past performance ( examples of supply orders executed against of Ministry of Defence orders, Public sectors, aerospace, paramilitary forces if any)
- 10) Availability of adequate infrastructure (List of machines and their production capacities) and technical expertise.
- 11) List of testing and support equipments
- 12) ISO/AS 9100 certification or any other certification.
- 13) Relevant clearances form the authorities/ ministries (if any)
- 14) Capacity and capability to undertake development work and to accept attendant financial and commercial risks.
- 15) Capacity and capability to market the product through marketing network and reliability to maintain confidentiality.
- 16) The vendors who have similar exposure will be given priority
- 17) Majority of the manufacturing equipment which needs simultaneous operations to be at one place.

With the above requirement the eligible parties will have to sign the confidentiality and non-disclosure agreement (CNDA) with DRDO for technical discussion including specifications, following which they shall be considered for giving the Transfer of Technology (ToT) on non-exclusive basis. The ToT to industry will be given based on their manufacturing capability, assurance on quality and capacity of production apart from the other terms and conditions.

The interested industries may contact / write to Director RCI Hyderabad or Director DIITM on the following address.

**Director, RCI**  
**DRDO, Ministry of Defence,**  
**Vignyana Kancha P.O ,**  
**Hyderabad-69**  
**Contact number: 040 – 24306000**  
**Fax: 040 - 24306002**

**Director, DIITM**  
**Room no: 446, DRDO Bhavan,**  
**DRDO HQrs, Ministry of Defence,**  
**Rajaji Marg, New Delhi-110011**  
**Contact no: 011-23016216/23007446**