

Galactic Guidance

Liebherr provides bearings and slewing drives for radio astronomy facility

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Liebherr's components product segment and mtex antenna technology joined forces in 2023 to provide the antennas for the next generation Very Large Array antennas (ngVLA), which will offer a glimpse into the infinite space reach.

The ngVLA will be the largest radio astronomy facility in the Northern Hemisphere. The azimuth adjustment of the antennas is made possible by three-row roller bearings with a diameter of three meters and precisely matched slewing drives. In addition, gear ring segments together with the drives ensure accurate elevation adjustment of the antenna. The interaction of slewing bearings and drives guarantees precise control and positioning of the antennas for the exploration of the universe.

The ngVLA will directly image the formation of solar system analogues for life with astrochemistry, characterize the assembly, structure and evolution of galaxies, test theories of gravity with galactic center pulsars, reveal the explosive universe through multi-messenger discoveries and so much more.

"The ultra-sensitive imaging capabilities of these groundbreaking instruments will give us an unprecedented look into space and help unlock the secrets of the universe," explains Lutz Stenvers, managing director of mtex antenna technology GmbH.

The new generation antennas, boasting a diameter of 18 meters, will be positioned in a clearly defined pattern throughout North America. The area with a total of 244 antennas will cover approximately 1,000 kilometers. The special arrangement of the antennas will ensure optimal data reception from the cosmos.

"Cutting-edge technology, precision engineering and a tireless commitment to scientific discovery rockets the project to the forefront of astrophysical research," continues Stenvers. "And Liebherr's components take an important role in this."

The slewing bearing is used for azimuth adjustment of the antenna to enable its precise positioning. Therefore, this roller bearing has a diameter of 3.3 m. Its weight of 4,128 kg provides for more stability; its axial runout of 0.1 mm and radial runout of 0.05 mm plays a decisive role when it comes to precision. The slewing bearing is designed to be free of backlash, making it ideal for adjusting the azimuth of the antenna.

As a complementary feature to the slewing bearing, the gear ring segment is of great importance for the elevation adjustment of the antenna, meeting the high demands on the gear quality. The two gear ring segments, each positioned on the sides of the horizontal antenna rotation axis, ensure its elevation adjustment. In addition, the interaction of the azimuth drives with the slewing bearing enables a high degree of precision, with which



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The mtex antenna technology and National Radio Astronomy Observatory team experienced Liebherr's ready-made roller slewing bearing for their next-generation Very Large Array antennas (ngVLA) for the first time in late 2023.

the satellite systems rotate around the tower axis. The key is a low torsional backlash and increased stiffness of the planetary gears. These optimizations make the adjustment mechanism of the entire system operate with maximum accuracy, targeting precise positioning in the long run. The elevation adjustment, which is responsible for the inclination of satellite dishes, uses the same drives as the azimuth adjustment, but with an adapted transmission ratio. The interplay of the two adjustment systems is indispensable for precision antenna alignment. This expertise is crucial for the symbiosis of the slewing bearing, gear rings and slewing drives as a unit.

According to the National Radio Astronomy Observatory (NRAO), radio astronomy can also be done during the daytime. The ngVLA will not be limited to nighttime regions of the sky. By capturing high-resolution images of gravitational wave events, the ngVLA will become one of the most powerful tools of multi-messenger astronomy.

