

Hydraulics & pneumatics

The Magazine of Fluid Power and Motion Control Systems

*Fluid Power
in action:*

Mobile equipment



**Rotary actuators
take
platform up,
over, and
under**



Mobile equipment: powerful, smart, and operator-friendly

Fluid power has always provided the optimum interface between IC engines on mobile equipment and their work functions. Modern machines enhance that interface with smart controls and operator comfort.

By R.T. Schneider, editor

Rotary actuators take platform up, over, and under

Mobile-equipment designers know that in the real world they have to deal with more than level surfaces and 2-dimensional access envelopes. Designers at JLG Industries, Inc., McConnellsburg, Pa., also know that additional obstacles at ceiling level will challenge the platform on their boom lifts. That's why they created the Model E300AJP electric boom lifts with the exclusive Jib-PLUS boom that provides access up, over, and around obstacles 30 ft above

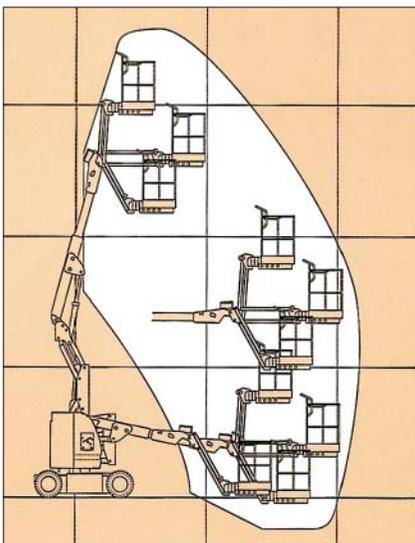
the floor.

Eight 6-V/370-Ahr batteries power the 15,000-lb boom lift through a 48-V DC electrical system. Dual electric traction motors, with automatic spring-applied multiple-disc brakes, handle travel. Wheel sensors feed information back to the travel control to ensure that both wheels work independently for improved traction on uneven surfaces or while driving over obstacles.

A permanent-magnet motor drives a highly efficient, internal crescent-gear pump to supply all the hydraulic functions from a 3-gal reservoir. The motor is energized to run the pump only when flow is needed, thus maximizing time between battery charges.

The control console on the 30- 3 48-in. operator's platform incorporates 12-V switches that energize solenoid-actuated, pressure-compensated cartridge valves in the operating circuits down at the chassis. A minimum number of controls is used and they are organized on the console to enhance the operator interface. High-contrast graphics and easy-to-understand symbols make the controls operator-friendly and help to shorten training time.

Reach specifications for the Model



Rotary actuators and cylinders help maneuver work platform on electric boom lift.



Only 48-in. wide, Model E300AJP boom lift is designed for almost unequaled maneuverability of work platform between overhead trusses and obstacles.

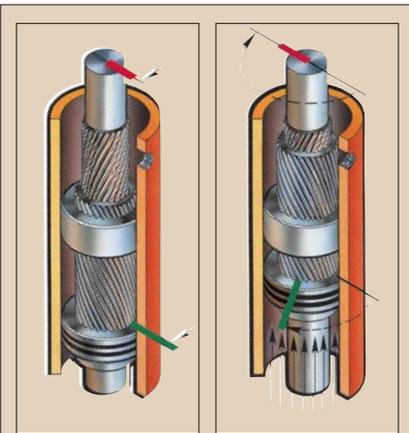
E300AJP include 20-ft, 6-in. horizontally; 13-ft, 1-in. of up-and-over height; and 360° of non-continuous rotation. The articulated jib produces a near-vertical orientation as it swings through a range from 55° downward to 86° upward. A rotary actuator at the base of the jibPLUS adds a 140° arc of side-to-side movement to the jib and platform. Finally, the 500-lb capacity platform is rotated 180° by a second rotary actuator. In other words, the E300AJP offers truly versatile positioning.

Helac Corp. builds both of the rotary actuators installed at the boom's working end. The L20-15 actuator between the main and jib booms is an integral part of the boom structure — function-

ing as a mounting bracket, bearing support, and power hinge, as well as the rotational device. The main boom is pinned to the upper hole in the actuator's clevis; the leveling cylinder is pinned to the lower hole. The jib-boom



Rotary actuators between main and jib booms (at right) and between jib boom and platform (left center) provide extra boom articulation capabilities to move platform precisely over, under, and around obstacles. Inset shows rear view of L20-15 rotary actuator and mounting clevis used on boom lift, with actuator's large-diameter, drilled-and-tapped shaft flange at top right.



Helac's sliding-spline operating concept converts linear piston motion into powerful rotation of the shaft — and in this case, the work platform. The actuator consists of a housing and two moving parts: the central shaft and the annular piston. Helical spline teeth on the shaft engage matching teeth on the piston's ID. A second set of helical splines on the piston's OD mesh with the ring gear in the housing. When hydraulic pressure is applied to the piston, it moves axially, while the helical gearing rotates the shaft efficiently.

assembly mounts right on the actuator. Its upper mounting bracket is bolted to the large-diameter, drilled-and-tapped shaft flange. The jib's lower mounting bracket is attached to the bottom of the actuator by a tie rod that passes through the actuator's shaft bore. (The tie rod functions as a second load path, for added safety.) The straddle orientation of the jib boom not only contributes stability and rigidity, but also results in an exceptional 65,000 in.-lb moment-load capacity (a 2.75:1 design margin).

The heavy load-carrying ability is largely due to Helac's patented integral journaled bearing design, which eliminates any need for external bearing support. Helac rotary actuators use a sliding-helical-gear operating concept that produces high torque from a compact envelope. (The Model L20-15 is rated for 15,000 in.-lb at 3000 psi.) High torque output combines with zero leakage for smooth operation with a solid feel, and permits selected positions to be held without drift. For extra safety on the E300AJP, the hydraulic circuit includes an integral, factory-installed counterbalance valve in a protected position between the clevises.

Telephone Farzin Motamed, JLG's director of product management, at 717 / 485-5161, or fax him at 717 / 485-6417.

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HELAC CORPORATION
 225 Battersby Avenue
 Enumclaw, WA 98022 USA
 Telephone 360.825.1601 or 800.327.2589
 Fax 360.825.1603
 www.helac.com