

Logan Rear Mount, Counter Shaft PTOs for Eaton Cummins Endurant HD Transmissions

Logan Delivers Higher Torque Margin, Controlled Engagement, and Improved PTO Durability for Endurant HD Rear-Mount Counter Shaft PTO Applications

In today's Class 6–8 vocational truck market, fleet owners and engineers are placing renewed emphasis on PTO durability during mobile and stationary PTO operation. For Endurant HD rear countershaft PTO applications—where auxiliary equipment may be operated during work cycles—reliability is shaped by two core system factors: available torque margin and how engagement energy is managed.

The Endurant HD rear PTO mounting location is countershaft-driven rather than flywheel-coupled. PTO operation therefore depends on transmission clutch engagement. In this architecture, engagement behavior, reflected inertia, and torque reserve become critical contributors to long-term durability.

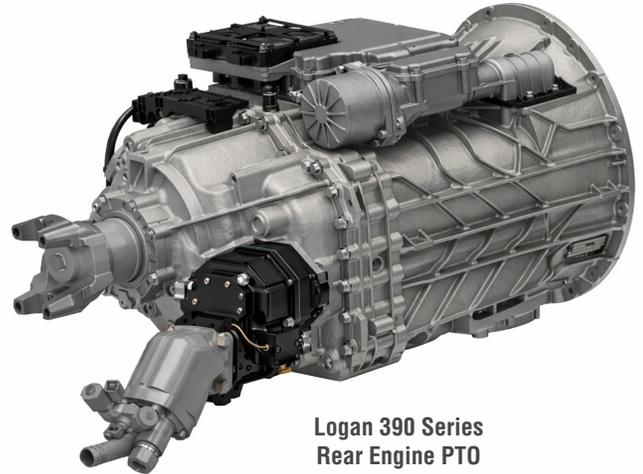
Eaton Cummins Joint Venture (ECJV) documentation identifies several rear counter-shaft PTO options for the Endurant HD platform supplied by multiple PTO manufacturers, including rear mount families such as Chelsea 524, Bezares 95X series, and Muncie P81/P84 series—alongside Logan's 390 Series rear PTO clutch offerings.

The Importance of Torque Margin in Endurant Rear Counter Shaft PTOs

In live PTO service, durability is often governed less by steady-state load and more by transient events—engagement energy, high-inertia starts, cyclic loading, and torsional vibration. Under these conditions,

published torque capacity functions as a practical proxy for operating margin under nonideal conditions such as changing loads, variable duty cycles, operator-controlled engagement and cold-start conditions.

Published rear counter shaft PTO ratings show that the Logan 390 Series Rear counter shaft PTO provides 390 lbft of continuous torque capacity and 490 lbft intermittent capacity at commonly applied ratios, creating a significant and measurable factor of safety between 33-50% versus several rear PTO families commonly specified for Endurant HD transmissions.



Logan 390 Series
Rear Engine PTO

Published torque comparisons show a clear torque advantage for the Logan 390 Series in Endurant HD rear counter shaft PTO applications:

Logan Model	Logan Torque (lb-ft)	Compared Against	Competitor Torque (lb-ft)	Difference (lb-ft)	Logan Advantage (%)
Logan 390 Series PTO	390	Chelsea 524	300	90	30.00%
Logan 390 Series PTO	390	Bezares 95X13D	293	97	33.10%
Logan 390 Series PTO	390	Bezares 95X15D	254	136	53.50%

Disc Pack Strength – SoftStart™ Control

Common rear counter shaft PTO offerings for Endurant HD are fundamentally gear-driven PTO gearboxes that are mechanically engaged (typically through a mechanical shift mechanism and/or pneumatic shift actuation). This conventional method of mechanical engagement can provide adequate torque transfer in steady operation; however, it does not function as a modulating clutch system whose primary role is to manage engagement energy at the PTO itself.

Logan's approach is fundamentally different: a multi-disc clutch-based torque transfer strategy with controlled engagement (SoftStart™) designed for smooth engagement and quick release.

Heavy-Duty Disc Pack for Continuous PTO Operation

PTO clutch durability is closely tied to disc pack strength and how engagement energy is introduced into the clutch. Logan's PTO clutch design emphasizes disc pack elements intended to support high-energy engagement:

- Sintered bronze friction material selected for stable engagement behavior under repeated energy events.
- Separator plate and release springs that support uniform engagement pressure and consistent release. Logan release springs minimize residual

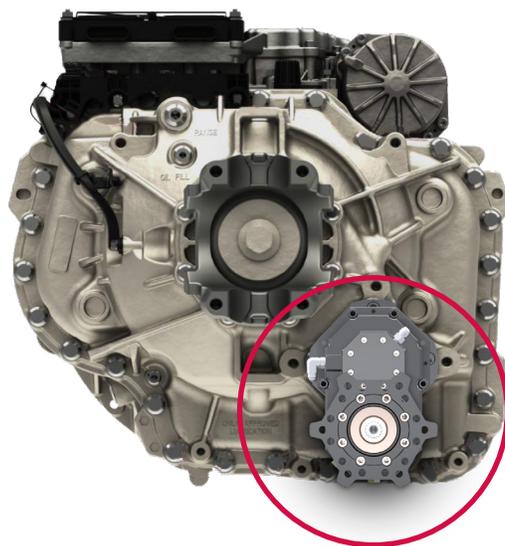
drag and provide a free running clearance when disengaged.

SoftStart™ Technology: Smoother Engagement, Longer Life

Abrupt engagement increases instantaneous energy absorption and accelerates wear—particularly in high-inertia applications. Logan's SoftStart™ clutch engagement is intended to control engagement rate and reduce torque spikes and clutch shock during startup. By moderating pressure during engagement, SoftStart™ limits peak energy input to the clutch pack while still delivering positive, repeatable engagement.

For fleets, the benefit is twofold:

- Reduced wear initiation during starts, especially when engagement occurs under load.
- Lower shock loading transmitted into shafts, couplings, and driven equipment.



4-Bolt Rear PTO

Reducing Backlash and Vibration for Long-Term PTO Reliability

In vocational service, micromotion at input and output shaft interfaces can accelerate wear and increase backlash over time. Logan literature describes high-alloy shafts which support maximum shaft diameters for increased strength. A patent pending keyless, spline-less design delivers a backlash-free, vibration resistant connection. This all leads to a backlash-reducing, vibration-resistant connection; intended to stabilize torque transfer and reduce sensitivity to torsional activity.

Real-World Benefits for Endurant HD Rear Counter Shaft PTO Users

Higher torque capacity allows the PTO to operate at a lower stress ratio during normal service, which improves clutch durability during cold starts, sudden load changes, engagement under load, and cyclic torque reversals.

In practice, the Logan design approach supports:

- Higher factor of safety during peak events (up to 50% more torque when compared to leading brands).
- Smooth, consistent engagement during heavy load conditions, and duty cycles.
- Reduced driveline shock and vibration sensitivity in torsionally active systems.



Use Case: Higher Safety Factor During High-Inertia Starts

Consider a mobile hydraulic application requiring approximately 60 HP at 1,000 PTO rpm. The corresponding steady torque is $T = \text{HP} \times 5252 / \text{rpm} \approx 60 \times 5252 / 1000 \approx 315 \text{ lbft}$. A rear counter shaft PTO rated at 300 lbft has little reserve in this simplified steady case, before accounting for cold oil start conditions or transient spikes.

With a 390 lbft continuous rating, the Logan 390 Series provides a higher operating margin.

Expressed as a factor of safety against the typical 315 lbft rating:

- 300 lbft rating: Factor of Safety $300/315 = 0.95$ (near or above the published limit).
- Logan 390 lbft continuous: Factor of Safety $390/315 = 1.24$ (+30% higher torque capacity).

That additional margin becomes especially valuable when engagement occurs under load during mobile operation, or when transient events elevate required torque above steady-state values.

Industries and Duty Cycles Where Logan PTOs Excel:

- Refuse & recycling — high-cycle PTO
- Snow & ice — cold starts, transients
- Roll-off / hooklift — high inertia loads
- Vacuum / jetting — large load swings
- Utility bucket/digger — variable hydraulics
- Tow & recovery — frequent short cycles
- Municipal Vehicles — stop-and-go PTO

Logan 390 Series Rear Counter Shaft PTO Ratings

Logan publishes torque and power at 1,000 rpm and 500 rpm to support low-speed operation planning and duty-cycle matching.

Ratio	Continuous Torque (lb-ft)	Continuous HP @1000 rpm	Continuous HP @500 rpm	Intermittent Torque (lb-ft)	Intermittent HP @1000 rpm	Intermittent HP @500 rpm
106%	390	74	37	490	93	47
132%	350	66	33	440	83	42
148%	330	63	31.5	410	78	39

Torque Comparison: Logan 390 Vs. Leading Rear-Mount PTOs

The table below summarizes published rear counter-shaft PTO torque ratings for commonly specified Endurant HD Rear Mount PTO families, alongside Logan 390 Series published values. Percent advantage is calculated as $(\text{Logan} - \text{Other}) / \text{Other}$. Note: Muncie values shown are identified as intermittent in Muncie literature.

Brand/Model	Internal Ratio	Published Basis	Torque (lb-ft)	Comparable Logan Value (lb-ft)	Difference (lb-ft)	% Advantage
Chelsea 524	111%	Rating (as published)	300	390	+90	30.0%
Bezares 95X10D	105%	Rating (as published)	382	390	+8	2.1%
Bezares 95X13D	130%	Rating (as published)	293	390	+97	33.1%
Bezares 95X15D	150%	Rating (as published)	254	390	+136	53.5%
Muncie P81Z2	100%	Intermittent	442	490	+48	10.9%
Muncie P84Z2	129%	Intermittent	300	440	+140	46.7%
Muncie P84Z4	92%	Intermittent	369	490	+121	32.8%



Defining the Right Rear Counter-Shaft PTO for Endurant HD Applications

For Endurant HD Rear Counter-Shaft applications, effective PTO specification should emphasize:

- Controlled engagement to manage energy and reduce shock during starts.
- Sufficient continuous-duty torque margin to avoid operating near published limits.
- A disc pack designed for repeated high-energy engagement events (not just intermittent, lightly loaded cycles).
- Stable, vibration-resistant interfaces to reduce backlash growth and long-term maintenance risk.

Frequently Asked Questions

Why does torque margin matter if my application has a known steady load?

Because rear counter shaft PTO duty includes engagement events and transients that can exceed steady-state demand, torque margin improves survivability and reduces long-term stress.

What is the main difference between Logan's approach and mechanically engaged rear PTO gearboxes?

Mechanically engaged rear counter-shaft PTOs provide on/off coupling via mechanical or pneumatic shift. Logan's clutch-based approach adds a disc pack and SoftStart™ engagement control to shape the engagement event and reduce shock loading.

How does SoftStart™ help in high inertia applications?

By moderating engagement rate to reduce torque spikes and peak energy input to the clutch pack during startup.

How should I compare ratings across brands?

Confirm the rating basis (continuous vs intermittent) and the operating duty cycle. The comparison table reflects the rating basis shown in the cited documents.

Does Logan support Endurant models beyond HD?

Logan has PTO clutches under development for Endurant HD platform models in additional mounting positions (top and bottom), in addition to rear counter shaft PTO offerings.

Sources and Citations

Muncie Power Products: "MP19-01 P81 and P84 Series"
(published Endurant rear PTO ratios and intermittent torque ratings).

Bezares 95X13D and 95X15D literature

Chelsea 524 series literature