

Z-Transmission - Benefits

Parameter	Conventional Mechanical Transmission	Z-Transmission	Advantage of Z-Transmission
Clutch	✓	X	Fewer wear prone elements
Gear Box	✓	X	No gear shifting required
Hydrostatic Braking	X	✓	Improved brake life
Continuous Variable Speed	X	✓	Improved fuel efficiency
Anti Stall	X	✓	Improved fuel efficiency
Hot Shift	X	✓	Rapid shifting from forward to reverse
Weight (Approx.)	150 kg	52 kg	Improved fuel efficiency
Operator Comfort	Average	Better	Less operator fatigue
Productivity	Average	Better	Increased per shift output
Length	417 mm	379 mm	~ 9% Compact*
Height	336 mm	282 mm	~ 16% Compact*
Width	314 mm	300 mm	~ 4% Compact*
Assembly	Complex	Simple	Reduced packaging design time
Installation time	More	Less	Increased through put production

* Package size comparison with conventional 12FX 12R mechanical gear box & Z-Trans with Servo Pump control

Potential Applications



Fork Lift



Mid Size Combine Harvester



Compact Tractor



Post Hole Digging



Light Dozing / Grading



Finish Mowing

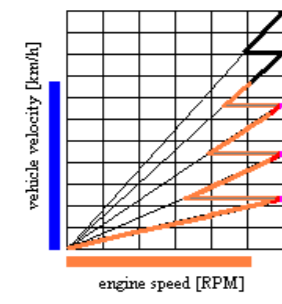
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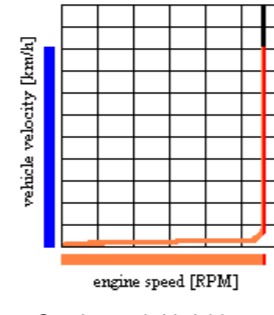
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Conventional Mechanical Transmission



Hydrostatic Transmission



Benefits

End Users

Simple Machine
No Clutch
No Gear Box

Ergonomic Machine

No gear shifting & stuck noise
Continuous variable speeds
Operator comfort
Operator safety
Simplified operator skills requirement

High Productivity Machine

No gear shifting
Hydrostatic braking - Reduced brake usage
Hot shifting possible

High Fuel Efficiency Machine

Light weight
Optimized engine speeds

- Smaller in size
- Compact tractor design
- Simple to assemble

- Continuously Variable speeds
- Smooth acceleration
- Operator Comfort

OEM

Differentiated Machine Design

More ergonomic vehicle
Improved vehicle driveability
Reduced emission – enable meeting regulation requirement

Reduced Time To Market

Self-contained HST package
Various HST displacements for different machine sizes

Improved Production Throughput

Less plumbing / connections
Reduced vehicle assembly stations
Reduced vehicle assembly time

Compact

- ~10% more compact[▲]
- ~175% high power density

[▲] Package size comparison with conventional 12F-X12R gear box

System Integration

- The mechanical coupling of the variable piston pump and motor provides a compact package with fewer leak paths.
- Fewer hose connections reduce assembly time.
- A small envelope allows for design flexibility.
- Modular construction eases fit-up to your vehicle.
- Noise and vibrations are reduced with “Drive-by wire” rather than mechanical linkages
- Output speed independent of engine RPM.

Programmable Vehicle Control

- Joystick or foot pedal command transfer functions are easily tuned to your specifications to provide aggressive or mild vehicle acceleration.
- Dynamic hydrostatic braking can be adjusted to provide a more abrupt or a smoother response to operator input.

Optional Control System Upgrades

- Electronic cruise control can be added to your electrohydraulic
- Compact Z-Transmission system for greater operator comfort and productivity.
- Programmable anti-stall prevents engine stalling by de-stroking the pump.

Eaton Z-Transmission Specifications

Parameter	Pump		Motor	
	70360	72400	74318	74328
Displacement – cc / rev (in³ / rev)	40.6 (2.48)	49.2 (3.0)	40.6 (2.48)	49.2 (3.0)**
Input Mounting Flange – SAE	B / BB - Pad	B / BB - Pad	B - Pad	
Max Speed – RPM	3600	3600	3600	3000
Nominal Pressure[~] - Bar (PSI)	345 (5000)	345 (5000)	345 (5000)	
Peak Pressure[~] - Bar (PSI)	380 (5500)	380 (5500)	380 (5500)	
Controls	Direct Manual	Manual Servo*, Electronic Proportional, Hydraulic Remote, Proportional Solenoid**	--	--
Additional Features	--	Diagnostic Ports Cooler Bypass Valve**, Filter Bypass Valve**	--	--
Output Power at Max Speed & Nominal Pressure - KW (HP)	--		59 (79)	59 (79)
Output Torque at Max Speed & Nominal Pressure - Nm (lbf-in)	--		156 (1383)	189 (1672)
Weight (kg)	52			
Input shaft- External splines SAE	20T (ANSI B92.1)	15T (SAE J498b)	--	
PTO shaft - External splines	20T (ANSI B92.1)	15T (SAE J498b)	--	
Output shaft - External splines	--	--	15T (SAE J498b)	
Speed Sensor	Not Available	Available	--	
Temperature - °C (°F)	107 (225)		107 (225)	
Continuous Case Pressure –Bar (PSI)	2 (25)	2 (25)	2 (25)	
Charge Relief settings (Range) - Bar (PSI)	6.89 – 20.68(100 – 300)	13.79 – 20.68 (200 – 300)	--	

[~] Nominal Pressure: Max delta system pressure at which component fatigue does not occur (pump life estimated by bearing life). For higher pressure requirements, please consult Eaton representative.
[~] Peak Pressure: Max operation pressure which is permissible for a short duration of time (t < 1 sec).
^{*} Manual Control with additional control features & Solenoid Control are available on request
^{**} Available on request

Z-Transmission Options

Z trans with 70360 Pump - Direct Manual (swash plate) control

Customized Valve Plate Design & Porting

- Reduced noise & swash plate moments
- #### Tapered Trunion Bearing Arrangement
- Reduces noise and vibration.
 - Improves neutral return thrust load capabilities.

Strengthened Mounting Flange

- Reduces customer requirements for additional support brackets.

Square Input Control Shaft

- Eases the assembly of customer installed control lever and reduces wear on control shaft and control lever.

Improved Swash Plate Design

- Reduces noise, and vibration.



Z-Transmission Options

Z-Transmission with 72400 Pump - Servo Control

- Smooth & precise control
- Lower operator efforts
- Modular design

Hydraulic Remote Control

- External pilot pressure input
- Swash mechanical feedback
- Useful where
 - Control cables not feasible
 - Electronic control not feasible

Servo Mechanical Control

- Swash mechanical feedback
- Control options
 - Neutral lockout
 - Neutral detent
 - De-stroke valve

Additional Features

- Displacement limiters
- Speed sensor
- Bypass cooler valve[▪]
- Supply & control orifices

[▪] Available on request

Electronic Proportional Control

- Swash mechanical feedback
- Swash electronic feedback (future option)
- Optimized vehicle performance
- Improved fuel efficiency
- Anti-stall
- Supporting electronic controllers



Electronic Proportional Control

Optimized Vehicle Performance – Adjustable vehicle responsiveness (aggressive vs. smooth) relative to changes in engine speed within engine capabilities.

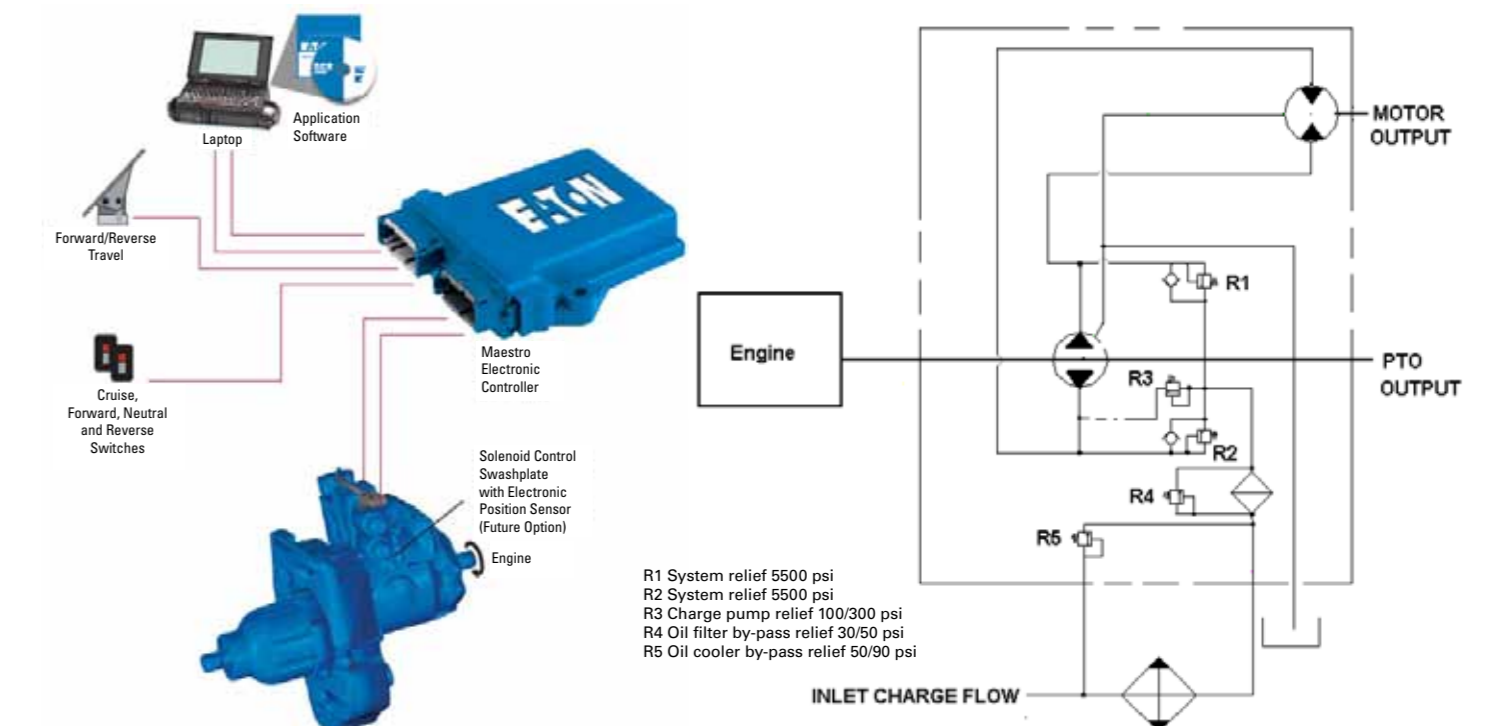
Anti-stall – ETAC’s scalable anti-stall sensitivity enables maximum engine loading and allows use of maximum available engine power over the full speed range. Response rate and load profile is adjustable to specific engine characteristics.

Operator Interfaces – Specifications and recommendations are provided for all system components, including the foot pedal, forward/neutral/ reverse selector switch, inching pedal, and interlock switches (parking brake and operator presence).

Improved Fuel Efficiency – The ETAC system offers more consistent performance compared to hydro mechanical (automotive drive) systems. Use of electronic control offers capability to match transmission performance relative to engine power more precisely. Greater maximum vehicle performance, reduced fuel consumption and faster cycle times result in reduced overall vehicle operating cost.

Supporting Electronic Controllers – The brain of the system is the MAESTRO ECM, which can be software configured to perform a wide range of functions.

Eaton Transmission Automotive Control (ETAC)



"Eaton's Z-Transmission Technology – Benefits World's Largest Tractor Manufacturer by enabling compact & ergonomic machine design and increased production throughput".