Eaton® Industrial Cylinders
Product Selection and Programs Guide

Customized Solutions for the Future

Powering Business Worldwide

Customizing Solutions for the Future… Hydraulics and Beyond.

Eaton's global cylinder footprint provides its channel with local engineering, project management, service, and repair support. With many years of cylinder experience, Eaton's cylinder products group deliver a comprehensive industrial cylinder program.

Available in standard or custom-engineered models, Eaton industrial cylinders offer reliable quality, variety and features to meet the needs of the most demanding applications around the world. Eaton's cylinders are reliable in the harshest environments including offshore drilling rigs, steel mills to the technologically advanced applications including bridges and hydropower gates.

Eaton's decades of application expertise and cylinder experience translates to better solutions for all types of infrastructure applications. Eaton's cylinders can be found worldwide, used in prestigious locations such as the Panama Canal, the Thao Long Dam, and the Emsworth Dam.

This experience coupled with the comprehensive product offering results in Eaton's reputation as a trusted leader for reliable, consistent, and high performance cylinders.

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Hydraulic Cylinders

Hydraulic cylinders convert fluid power energy into linear mechanical energy. As pressurized fluid enters the cap end of a cylinder, the fluid force pushes on the piston extending the piston rod creating a linear force. As pressurized fluid enters the rod end of the cylinder, the fluid force pushes on the piston retracting the piston rod. Eaton industrial cylinders are manufactured to order and offer a wide range of bore, rod and mounting combinations. The size and style of a hydraulic cylinder will vary depending on the application and load requirements.

Tie Rod: Industrial Tie Rod cylinders are held together by the use of tie rods and nuts. Considered one of the most common types of constructions meeting the (NFPA and ISO) industry standards.

Light Duty Pneumatic: Broad range of repairable, light weight, low-cost, air cylinders.

Threaded: Head and cap thread onto the body tube, providing a clean, compact profile ideal for wash-down environments or applications with space limitations.

Welded: Eliminate system leaks in high side load applications with the innovative sealing design. Built with high-yield strength steel to keep systems operating smoother.

Mill Duty: Engineered to survive in the extremely demanding environments of primary metals, and other HD type applications.

Extra Large Custom: Custom engineered to order cylinder solutions for some of the world's toughest applications.

Eatonite® Laser Cladding: Eatonite laser cladding is a high performance, field repairable rod coating designed for fresh and saltwater environments. It offers premier corrosion resistance for piston rods.

Eaton Cylinder 3 Day Express Program
When you need it fast!

Eaton Express Ready Cylinders:

- **NZ NFPA**
  High Pressure, Hydraulic Tie Rod
- **RE NFPA**
  Low Pressure Hydraulic/Pneumatic Tie Rod
- **VP**
  Single Rod Aluminum, Pneumatic Tie Rod
- **TA**
  Threaded Series

1.50 – 6.00" Bore, Stroke to 60",
Many Mounts, Cushions, and more.

Eaton Express Program Requirements:

- Clearly mark orders with "Cylinder Express" and email to Express@Eaton.com
- Orders must be drop shipped to the end-customer's location (Exceptions will be made for shipments to Canada and Mexico only)
- Valid customer ship-to information & routing instructions are required at time of order
- Standard distributor CCR discounts apply.
- Express orders received by 12:00 pm CST will ship by the end of the 3rd day after order receipt
- Maximum order quantity of 5 per model code, per ship-to address

For more information:

- Go to PowerSource, Cylinders
- Go to www.eaton.com/Eaton/ProductsServices/Hydraulics/Cylinders
- Literature: E-CYNC-BB002-E

Selection and Use

It's good to understand where and why cylinders are used.

- Typically, industrial cylinders can be found in manufacturing, metals processing, oil and gas, and renewable energy. Cylinders are used for stabilizing oil rigs in ocean water, rotating the turbine blades on a wind turbine, and regulating water flow of a hydro-electric dam.
- When choosing cylinders, there are a few key selection criteria to keep in mind: operating pressure, force requirements, bore size and rod diameter, stroke, mounting, environmental conditions, speed, operating fluid, and port and rod end connections.

Selection Criteria

The Online Cylinder Pricing and CAD Configurator
www.Eaton.com/cylinderconfig

The Online Cylinder Pricing and CAD Configurator

The Online Cylinder Pricing and CAD Configurator is a configuration tool designed to help equipment manufacturers and distributors create model codes, list prices, and CAD drawings for our cylinder products. You can download the exact product model needed from more than 150 CAD and graphic formats, including native formats in Autodesk® Inventor™, SolidWorks®, CATIA® and many more. These on-demand capabilities eliminate the wait for CAD drawings and cylinder quotations.

This user-friendly tool delivers quick access to CAD drawings and list prices to meet distributor needs whether behind the desk or on the go. Our mobile device compatibility feature lets you to configure a cylinder while sitting in a meeting with a customer. It provides you with online immediate access to:

- List Pricing (Distributor feature only)
- Typical Lead-times
- 2D & 3D Drawings
- PDF Datasheets
- Application Guides
- Calculation Tools
- IOS and Android Mobile Device Compatibility

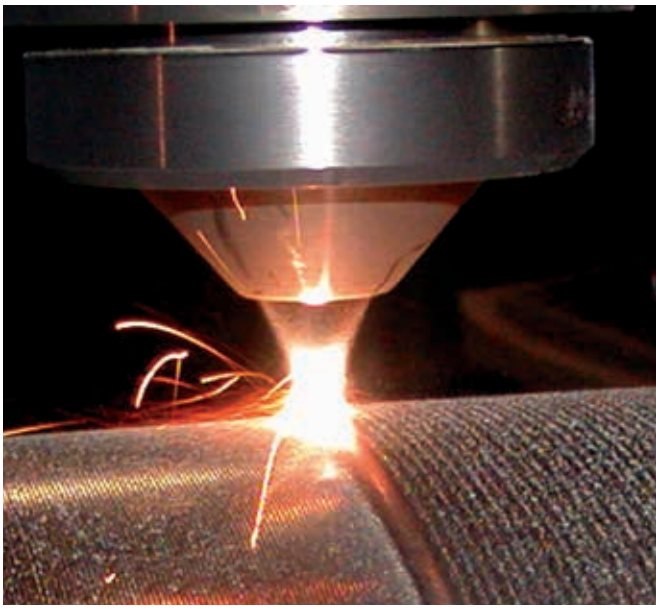
Eatonite® Laser Cladding

Eatonite laser cladding provides uptime and reliability to enhance operating efficiency. Anti-corrosion protection is an important requirement for high-functioning cylinders, and our award-winning Eatonite anti-corrosion laser cladding is best in class.

Eatonite laser cladding is a high-performance, field repairable, third-party certified, cylinder rod coating for the most demanding salt water applications and harshest operating environments.

A primary benefit of Eatonite laser cladding is field repairability. Over time, rods are damaged due to:

- Harsh environments
- Improper material handling practices
- Hard debris falling from the upper derrick or floating in the water
- Swinging chains



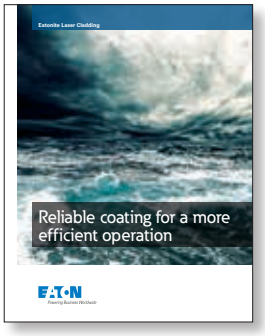
Application Base Coatings: ABC

Laser cladded coatings	ABC-L1	Eatonite™ ABC-L1 laser cladding is a high performance, field repairable, DNV certified, cylinder rod coating for the most demanding applications and harshest operating environments, that provides uptime and reliability to enhance offshore rig / ship operating efficiency. Premier fresh and salt water corrosion resistance designed for salt water splash zone.
	ABC-L2	Laser cladding cylinder rod coating with excellent corrosion and ductility for non splash zone applications.
Ceramic and HVOF coatings	ABC-H	Metallic HVOF sprayed coating for highly corrosive and abrasive environments.
	ABC-P3	Metal oxide plasma sprayed coating for abrasion and corrosion resistance in fresh and brackish water environments and for Hypos applications.
Galvanic Coatings	ABC-G2	Galvanic nickel chromium plating with standard wear resistance and increased corrosion resistance.
	ABC-G1	Galvanic hard chromium plating with standard wear resistance and corrosion resistance.

Comprehensive coating portfolio – Let us help select the right coating for your application.

Find out more about
Eatonite Laser Cladding:
E-CYNC-BB004-E

Or go to:
http://www.eaton.com/Eatonite



Benefits of Eatonite Laser Cladding

- **Corrosion-resistance** – Field tests have shown Eaton's cylinders have been offshore/on rigs for more than 5 years (43,800 hours +) without performance degradation in a salt water environments
- **Flexibility without cracking** – Can be applied to cylinder rods up to 21 meters long and can withstand up to 180-degree bend without cracking
- **Impact resistance and wear** – Withstands impact up to 24 foot pounds of force without cracking
- **Field repairable** – Repair damaged coatings on-site

Features of Eatonite Laser Cladding

- Third party certified
- Suitable for offshore deep water exploration and production, marine and other heavy duty applications
- Applicable to new or refurbished hydraulic cylinders
- Proven in offshore cylinder applications
- Optimized corrosion, wear, scratch and impact resistance
- Tight process control designed for consistent results
- Optimized for ductility and toughness

Eaton Industrial Cylinders

Application Data Sheet

Submit an application data sheet today to have Eaton's cylinder engineers recommend the right cylinder for your application.

Cylinder Application Data Sheet

Customer Name:					
Contact:					
Phone:		Fax:		E-mail:	
Project Name/RFQ #				RFQ Due Date	
Application				Market	

Cylinder Specifications					
Quantity		Customer Drawing #		Rev #	
Series/Construction	Mounting Style	Bore	Rod Diameter	Stroke	
Cushions	Rod end style	Port Size/Type	Port Position	Seals	
Non Cushioned					

Cylinder Orientation		Degrees from Vertical	°
Rod End Connection		Known Side Load	
Weight connected to rod			
Special Rod Material			
Transducer Requirements			
3rd Party Certification	None		

Cylinder Operating Environment					
Environment			Other (define)		
Operation Fluid			Temperature	°C	
Operating Pressure Extend			Operating Pressure Retract		
Extend Force			Retract Force		
Extend Velocity			Retract Velocity		
Cycle Rate		Cycle Life of Cylinder		Cycle Life Seals	

Other Requirements	
Material Certs Required:	None
Special Paint Requirements:	
Other Special Requirements:	None

Additional Information/Special Requirements:			
Prepared By		Date	

Industrial Tie-Rod

Series	Description	Comment
Series NZ	3000 PSI, NFPA 1-8" Bore Vickers	Lead cylinder product to drive sales growth Easy interchangeability - Full range of NFPA interchangeable mounts to allow for drop in replacement Designed for easy low cost serviceability - Special tools not required - Unitized rod cartridge design for easy seal installation Designed for long life - High strength steel heads, caps and tubing - Rolled tie rod threads Direct replacement for: Parker (Miller, Atlas, Shrader, Lin-Act), Rexroth, Sheffer, Yates
Series VG	3000 PSI, 10-30" Bore Vickers	
Series TV	210 bar ISO 6020-2 DIN 24552 25–200mm Bore Vickers	Easy Interchangeability Full range of ISO 6020-2 interchangeable mounts to allow for drop in replacement Competitors to replace: Parker (Miller, Atlas, Shrader, Lin-Act), Rexroth, Sheffer
Series RE/RF	250 PSI Air, 1000 PSI Hydraulic NFPA , 1½ -14" Bore Vickers	Heavy duty steel pneumatic NFPA cylinder Improves application coverage, and lead-time Direct replacement for: Parker (Miller, Atlas, Shrader, Lin-Act), Rexroth, Sheffer

Light Duty Pneumatics

Series	Description	Comment
Series L		
VP	NFPA Aluminum, 3/4-8" Bore 250 PSI	Repairable, low cost aluminum tie-rod cylinder. 22 NFPA interchangeable mounts
RL	Rodless 16–80mm Bore 15–150 PSI	Compact, smooth and precise performance at high velocity. Extruded aluminum
BL	Non-Rotating, 1.125–4" Bore 150–250 PSI	Aluminum twin rod design for non-rotating, anti-torque applications. Interchangeable with NFPA cylinders
ML	ISO 6431/VDMA 24562, 32–320 mm Bore	Modular design with wide range of bolt-on mountings
SL	Stainless steel, 1.125 – 8" Bore 250 PSI	NFPA interchangeable mounts. 303/304 Stainless steel construction with aluminum alloy piston Competitors to replace: Festo, Parker, SMC

Welded Series

Series	Description	Comment
Series W		
WH	3000 PSI 4 – 12" Bore Vickers	Compact design fits into tight spaces Designed for serviceability - Fully serviceable for lower downtime Designed for long life - High strength caps and tubing - Precision machined ductile iron gland provides a long bearing surface for side-loading resistance and prevention of premature seal failure - Mechanically energized seals ensures smooth operation for longer life Competitors to replace: Hanna, Hunger (Parker/Atlas, Clover, CRC)

Mill Duty Series

Series	Description	Comment
Series M		
EM	250/2000/3000 PSI Imperial 2–16" Bore Eaton	Heavy duty Mill Duty construction Designed for easy low cost serviceability - Fully serviceable for lower downtime Designed for long life - An integral bearing and seal design featuring heavy duty wearbands resists side loads. The wide separation of these wearbands reduce bearing stresses and maximize cylinder service - Greater bending stress capacity for increased durability - Threaded body flanges provides 22% better yield strength vs. welded material for higher shear safety factors - High strength wearbands eliminate metal to metal contact providing increased load carrying capability Direct replacement for: Rexroth, Hanna, Anker Holth, Hunger, Hydranamics
IM	25 MPA ISO 6022 Metric 40–320 mm Bore Eaton	

Threaded Series

Series	Description	Comment
Series	3/4-8" Bore	Compact profile eliminates wasted space
TA/TB	250 PSI air; 1000 PSI hydraulic	Clean design, no tie rods to collect dirt and debris
	Vickers	Ideal for wash-down environments (e.g. Food processing equipment) Fully adjustable cushions Designed for long life - Nitride cast iron rod cartridge - High strength steel heads, caps and tubing - Hardened piston rod - Long heads threaded onto the body provide greater side load distribution and improved rod guidance

XL Series

Series	Description	Comment
XL	300–1000 mm Bore	No industry standard Engineered to order Varying construction methods 3rd party certifications, as required Direct replacement for: Rexroth, Douce

Literature Reference

Access the complete Eaton Product Literature library at PowerSource.com > Tools > Literature

NZ Heavy Duty Tie Rod:	V-CYTR-MC002-E2
VG Series Large Bore Heavy Duty:	V-CYTR-MC001-E
TV Series Hydraulic:	4147
RE/RF Series Medium Duty Tie Rod:	V-CYTR-MC002-E4
Light Duty Tie Rod:	V-CYPN-MC001-E
EM Series, Imperial Mill Type:	E-CYMG-MC001-E1
IM Series Metric Mill Duty:	E-CYMG-MC002-E
WH Series Industrial Welded:	V-CC-MC-0002-E
XL Cylinders:	E-CYCM-MS008-E1
NZ / RE Maintenance Manual	E-CYNC-BB001-E

Eaton Industrial Cylinders

Market Application

For more information about these and other products, Guide to Mobile and Industrial Hydraulics M-HYOV-MR001-E4. www.eatonpowersource.com/literature/

		Tie Rod				Mill Type		Welded	Threaded	XL
		Heavy Duty			Medium Duty	Imperial	Metric			Custom
Market	**Application**	**NZ**	**VG**	**TV**	**RE/RF**	**EM**	**IM**	**WH**	**TA/TB**	
Plastic Machinery	Blow Molds	X	X	X						
	Injection Molding	X	X	X	X				X	
	Jack Rams					X	X			X
	Structural Foam	X	X	X					X	
Machine Tool	Transfer Lines	X	X	X	X				X	
	Clamping	X		X	X					
	Feed	X		X	X					
Discrete Manufacturing	Metal Forming and Cutting	X	X	X		X	X			
	Press Brakes	X	X	X		X	X			
	Extrusion Presses	X	X	X		X	X			X
	Forging Presses	X	X	X		X	X			
Processing	Furnace Cylinders	X		X		X	X			X
	Rolling Mill	X		X		X	X			
	Pulp and Paper Mills	X		X					X	
	Food Processing Equipment	X		X					X	
Mining & Bulk Material Handling	Stacker Reclaimers					X	X	X		X
	Rope Shovels									X
	Tippers and Crushers					X	X			X
	High Wall Mining Systems					X	X	X		
	Tunnel Boring					X	X	X		X
Oil & Gas	Motion Compensation					X	X			X
	Cantilever Skidding Systems					X	X			X
	Pipe Laying Equipment					X	X		X	
	Mooring Systems					X	X			
	BOP Handling									X
	Chain Jack Systems					X	X	X	X	
Alternative Energy	Turbine Governer Control	X	X	X		X	X			X
	Wind Turbine Pitch Control	X		X		X	X	X		
	Nuclear Power	X		X	X					
Marine	Ship Steering Systems & A-frames	X	X			X	X	X		
	Naval Vessels	X	X			X	X	X		
	Subsea Systems					X	X		X	
	Split and Piling Barge					X	X		X	X
	Dredging and Dump Scowl					X	X		X	X
Civil	Moveable Bridges					X	X			X
	Flood Control Gates	X	X	X		X	X			X
	Locks and Canal Gates					X	X			X
	Dam Gates	X	X	X		X	X			X
	Rising Stem Valve Cylinders					X	X			X
Scrap & Waste Management	Cardboard Balers					X	X	X	X	
	Rubber Balers					X	X	X	X	
	Stationary Compactors					X	X	X	X	
Entertainment	Motion Bases	X	X	X	X				X	X
	Wave Making Machines	X	X	X	X				X	X
	Simulators	X	X	X	X				X	
	Animation	X		X	X				X	

Literature Reference:
www.eatonpowersource.com/literature/

NZ Heavy Duty Tie Rod:	V-CYTR-MC002-E2	EM Series, Imperial Mill Type:	E-CYMG-MC001-E1
VG Series Large Bore Heavy Duty:	V-CYTR-MC001-E	IM Series Metric Mill Duty:	E-CYMG-MC002-E
TV Series Hydraulic:	4147	WH Series Industrial Welded:	V-CC-MC-0002-E
RE/RF Series Medium Duty Tie Rod:	V-CYTR-MC002-E4	XL Cylinders:	E-CYCM-MS008-E1
Light Duty Tie Rod:	V-CYPN-MC001-E		

DISCRETE MANUFACTURING

Markets
- Metal Forming
- Injection Molding
- Blow Mold Machines
- Forging & Extrusion Press
- Press Brake
- Die Casting
- Clamping
- Transfer Lines

Cylinders
- Tie Rod: NZ, VG, TV and RE/RF
- Mill Type: EM, IM
- Threaded: TA/TB
- XL Custom

PROCESSING

Markets
- Tilt & Electric Arc Furnace
- Grinding Mills
- Steel Processing
- Foundries
- Food Processing
- Pulp & Paper Mills
- Balers & Compactors

Cylinders
- Tie Rod: NZ and TV
- Mill Type: EM, IM
- Threaded TA/TB
- XL Custom

DISCRETE MANUFACTURING

VG NZ

Injection Molds:
21 standard NFPA interchangeable mounts. Unitized rod bearing provides maximum bearing support and wear resistance. Fully adjustable cushion allows maximum acceleration, faster cycle times, and increased machine production.

RE/RF

Metal Forming:
Bore sizes range from 1.50" to 14". 17 NFPA interchangeable mounts available. Unitized rod bearing allows for easy rod seal maintenance.

EM IM

Extrusion Press:
Integral bearing design with wearbands provides improved side load capability. Threaded body flange offers higher safety factors over welded flange designs.

TA/TB

Clamping:
Compact design to address space constraints. Able to withstand high side loads. Bore sizes range from 3/4" to 8".

PROCESSING

NZ TV VG

Pulp and Paper Mills:
Imperial and metric heavy duty tie rod cylinders. Electro-hydraulic options allow for precise position measurement.

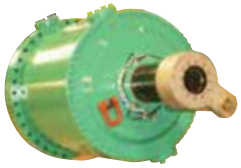
EM IM

Rolling Mill:
Imperial and metric designs available. Threaded body flange provide improved performance and increased safety factor.

TA/TB

Food Processing:
Clean compact design is ideal for wash-down environments. Able to withstand high side loads. Bore sizes range from 3/4" to 8".

XL Custom



Furnace, Steel Processing, Foundries:
Bore sizes range from 300 to 1000 mm. Engineered to order. Alternative coatings offer enhanced wear and abrasion.

Eaton Industrial Cylinders
Market Application

MATERIAL HANDLING / MINING

Markets
- Stacker Reclaimers
- Rope Shovels
- Tippers and Crushers
- High Wall Mining Systems
- Tunnel Boring

Cylinders
- Mill Type: EM, IM
- Welded: WH
- XL Custom

ALTERNATIVE ENERGY / WAVE

Equipment Types
- Turbine Governor Control
- Wind Turbines
- Nuclear Power
- Wave Power

Cylinders
- Tie Rod: NZ, VG,TV and RE/RF
- Mill Type: EM, IM
- Threaded: TA/TB
- XL Custom

MINING / MATERIAL HANDLING

EM IM

Stacker Reclaimer:
Integral bearing design with wearbands provides improved side load capability. Threaded body flange offers higher safety factors over welded flange designs.

WH

High Wall Mining System:
Industrial grade cylinder with gland and sealing system designed for side load protection. Bore sizes range from 4" to 12".

XL Custom

Rope Shovels:
Engineered-to-order hydraulic cylinders. Alternative coatings offer enhanced wear and abrasion.

ALTERNATIVE ENERGY / WAVE

EM IM

Wave Power:
Threaded body flange offers higher safety factors over welded flange designs. Eatonite Laser Cladding extends the rod coating life and increases operational predictability.

RE/RF

Nuclear Power:
Bore sizes range from 1.50" to 14". 17 NFPA interchangeable mounts available. Unitized rod bearing allows for easy rod seal maintenance.

WH

Wind Turbine:
Industrial grade cylinder with gland and sealing system designed for side load protection. Bore sizes range from 4" to 12".

XL Custom

Turbine Governor Control:
Bore sizes range from 300 to 1000 mm. Engineered-to-order with electro-hydraulic options for precise position measurement.

Eaton Industrial Cylinders
Market Application

OIL & GAS

Markets
- Motion Compensation
- Cantilever Skidding Systems
- Pipe Laying Equipment
- Mooring Systems
- BOP Handling
- Chain Jack Systems
- Cranes

Cylinders
- Mill Type: EM, IM
- Welded: WH
- Threaded: TA/TB
- XL Custom

MARINE

Markets
- Ship Steering Systems & A-frames
- Naval Vessels
- Subsea Systems
- Split and Piling barge
- Dredging and Dump Scowl
- Salvage Equipment

Cylinders
- Tie Rod: NZ, VG
- Mill Type: EM, IM
- Welded: WH
- Threaded: TA/TB
- XL Custom

OIL & GAS

EM IM

Mooring:
Imperial and Metric designs available. Electro-hydraulic options allow for precise position measurement. ABS and DNV certification available.

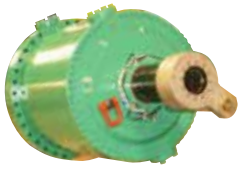
WH

Chain Jack Systems:
Industrial grade cylinder with gland and sealing system designed for side load protection. Bore sizes range from 4" to 12". ABS and DNV certification available.

TA/TB

Pipe Laying Equipment, Clamping:
Compact design to address space constraints. Able to withstand high side loads. Bore sizes range from 3/4" to 8".

XL Custom



Motion Compensation:
3rd party certified engineered cylinders with Eatonite Laser Cladding extends life and increases operational predictability. ABS and DNV certification available.

MARINE

NZ VG

Ship Steering:
21 standard NFPA interchangeable mounts. Unitized rod bearing provides maximum bearing support and wear resistance. ABS and DNV certification available.

EM IM

Subsea Vessels:
Imperial and Metric designs available. Eatonite Laser Cladding extends life of the piston rods. ABS and DNV certification available.

WH

A-Frames:
Industrial grade cylinder with gland and sealing system designed for side load protection. Bore sizes range from 4" to 12". ABS and DNV certification available.

XL Custom

Split and Piling Barge and Dredging:
Bore sizes range from 300 to 1000 mm. Engineered to order. Alternative coatings offer enhanced wear and abrasion.

Eaton Industrial Cylinders

Market Application

CIVIL

Markets
- Moveable Bridges
- Flood Control Gates
- Locks and Canal Gates
- Dam Gates
- Rising Stem Valve Cylinders
- Waste Water Treatment

Cylinders
- Mill Type: EM, IM
- Welded: WH
- Threaded: TA/TB
- XL Custom

SCRAP & WASTE MANAGEMENT

Markets
- Cardboard balers
- Rubber balers
- Stationary Compactors

Cylinders
- Mill Type: EM, IM
- Welded: WH
- Threaded: TA/TB

CIVIL

EM IM

Flood Control Gate:
Threaded body flange provides improved performance and increased safety factor. Electro-hydraulic options allow for precise position measurement.

WH

Rasing Stem Cylinders:
Gland and sealing system designed for side load protection. Bore sizes range from 4" to 12". Alternative rod coatings available to extend cylinder life.

XL Custom

Lock and Canal, Dam Gates:
Engineered-to-order cylinders. Eatonite Laser Cladding extends cylinder life and increases operational predictability. Variety of position measurement systems available.

SCRAP & WASTE MANAGEMENT

EM IM

Cardboard and Rubber Baler:
Threaded body flange provides improved performance and increased safety factor. Electro-hydraulic options allow for precise position measurement.

WH

Stationary Compactor:
Gland and sealing system designed for side load protection. Bore sizes range from 4" to 12".

TA/TB

Cardboard and Rubber Baler:
Compact profile eliminates wasted space. Able to withstand high side loads. Bore sizes range from 3/4" to 8".

Powering Business Worldwide

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