

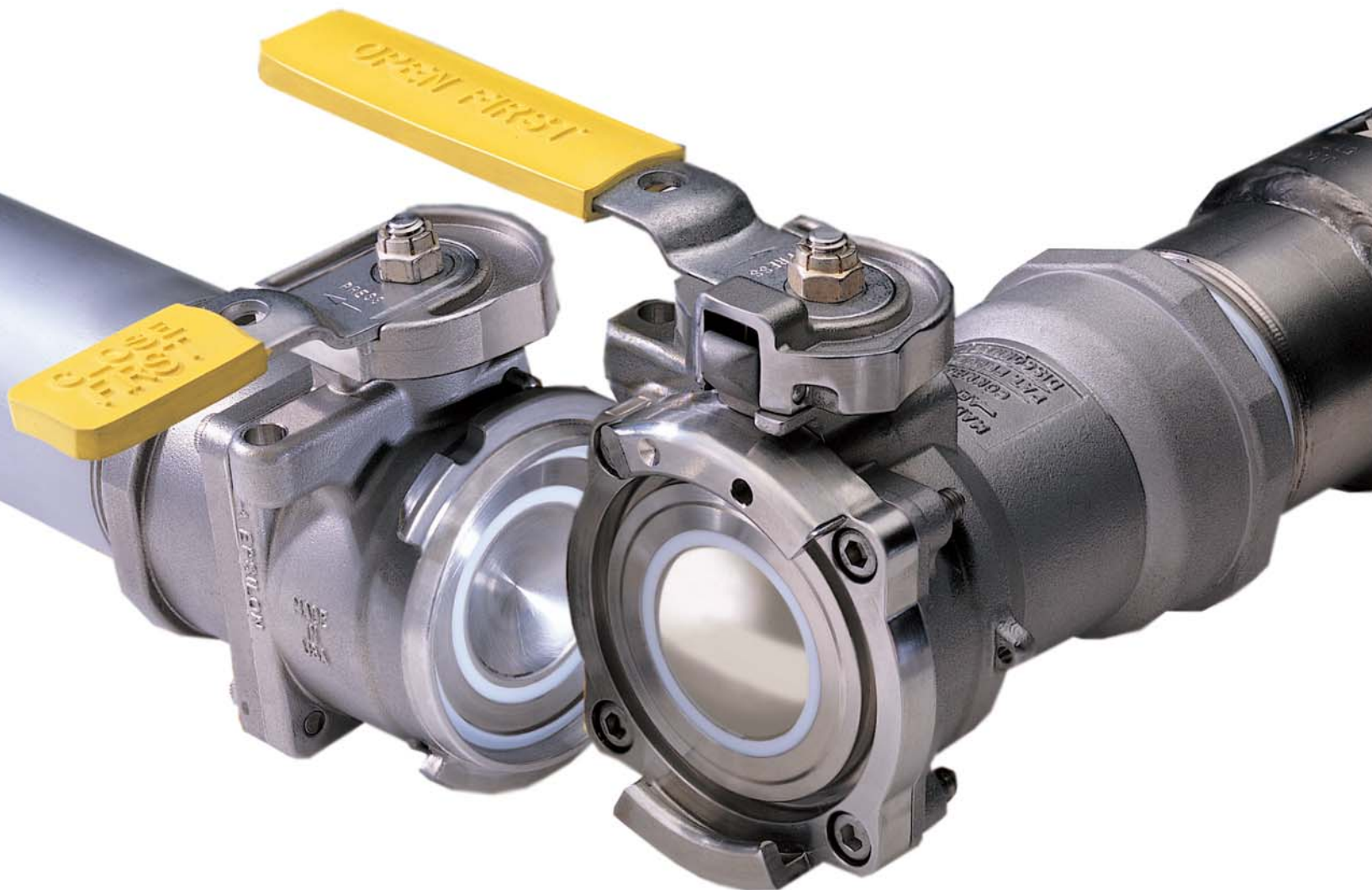
**EATON**

**Aerospace**

**Fluid Conveyance**

EPSILON® Coupling

- Precision dry disconnect system
- Outstanding throughput capabilities
- Improved worker safety
- Designed for ease of maintenance



# Eaton EPSILON® Coupling

**The Eaton EPSILON® coupling and containment system is the ultimate dry-disconnect coupling.**

Until now, conventional dry-disconnect coupling technology for the chemical processing industry has not lived up to its promise. But all that has changed.

The Eaton EPSILON® coupling and containment system provides chemical processors with dry-disconnect couplings that are in a class by themselves. By carefully listening to customer needs, Eaton engineers created a fluid containment system that allows the safe connection and disconnection of flexible hoses. The modular Eaton design dramatically reduces worker exposure to chemicals and the release of chemicals into the environment. It's dry-disconnect technology that actually works. And we have the experience to prove it. Emissions and spillage in chemical transfer operations cost companies millions of dollars in lost work in process, lost process yields, and ultimately, lost revenues.

The Eaton EPSILON® dry-disconnect coupling system offers the ideal solution to chemical transfer applications for tank cars, rail cars, bulk storage, process vessel, reactor and filtration units.

Because it is engineered as a single unit, the fluid containment system reduces the need for multiple valving and coupling components as well as the need for bulky, expensive hood and trough systems to contain and manage the spillage associated with traditional fluid connections. It is a system designed to provide space savings and greater design flexibility when engineering or re-engineering equipment and facilities.

Best of all, the positive shut-off valves of both coupling halves not only prevent the on-going release of chemicals found in most batch processing applications, but they also eliminate line contamination from the environment during the connection and disconnection process. Eaton's EPSILON® dry-disconnect couplings protect process chemicals from the environment and protect the environment from the chemicals.



Manifold station with EPSILON® adapters.



EPSILON® coupler mounted to the end of a chemical hose.

# Technology For The Real World

## Technology 1 Concave/Convex Full-Flow Shut-Off Valve

A convex ball nests in a concave ball to virtually eliminate any cavity between the mating halves. The positive shut-off ball valves, and the absence of a cavity between them, prevent chemical loss when the coupling is disconnected. Each half is an independently operated, positive shut-off ball valve that is controlled by manually rotating the valve handles. The straight-through Eaton EPSILON® valve design also provides unrestricted, high flow in either direction and low pressure drop. All metal wetted components are 316 stainless steel or Hastelloy®.

## Technology 2 Spring Energized & Spring Loaded PTFE U-Cup Sealing

An energized wave spring holds the stem seal, face seal, and flange seal out, providing initial sealing. The spring supplies all of the load required for sealing when the media pressure is too low to fully actuate the lips of the seal. And testing confirms that our ultra low spillage and emission specifications are still achieved after 2,000 cycles.

## Technology 3 Male and Female Lug and Flange Connection Interfaces

Ramped lug and flange interfaces are first aligned and then connected with a push, followed by a quarter (90°) turn. This "instant" connection method is done by hand without tools in order to create compression on the critical interface seal. There are no threads to damage by crossing or over tightening. And no failure-prone cam and groove latch connections to secure.

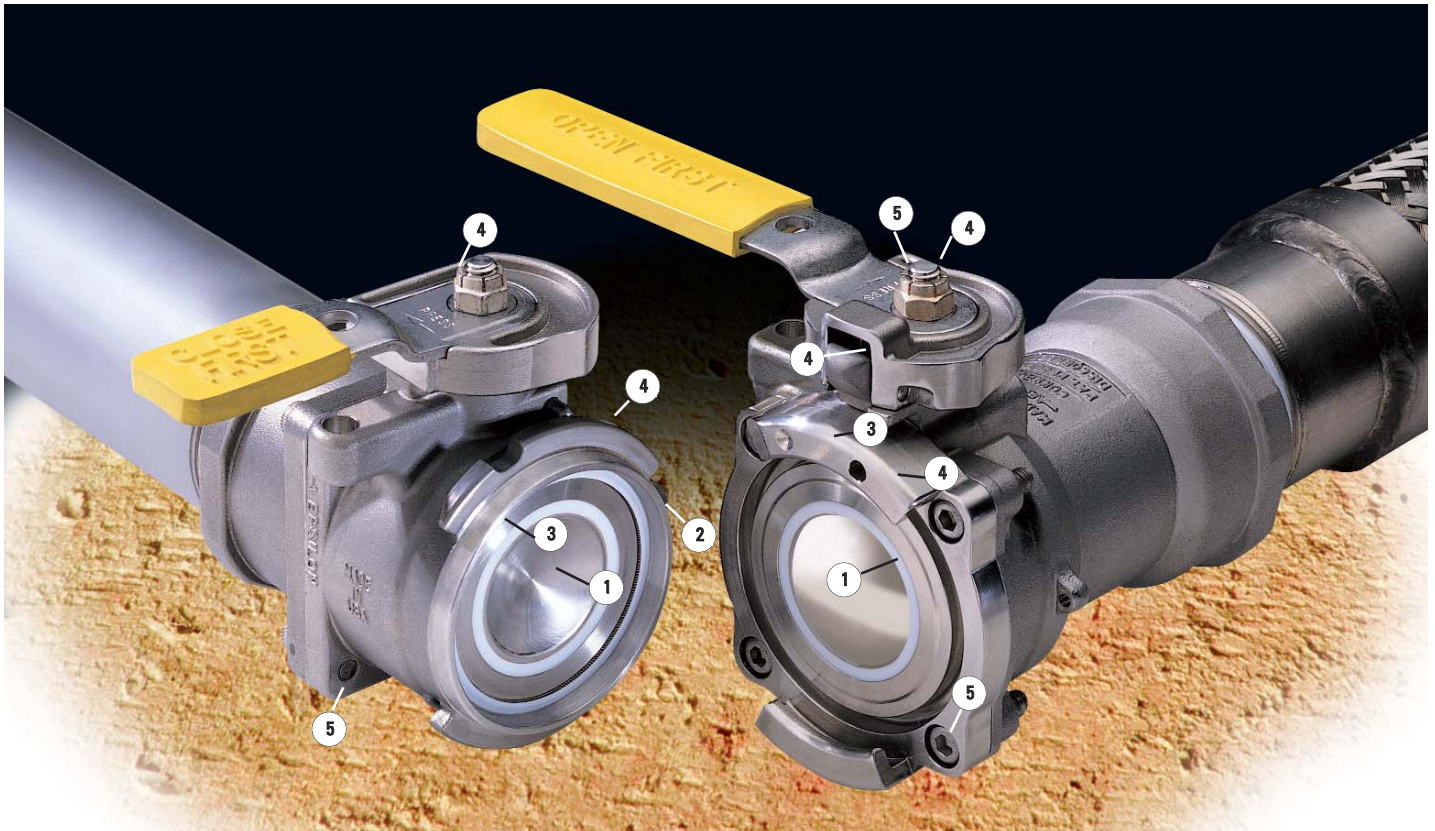
## Technology 4 Independent and Redundant Safety Interlocks

EPSILON® technology involves 5 independent and redundant mechanical interlocks. They require deliberate sequential action by users, thereby eliminating unintentional spills and catastrophic chemical releases that threaten worker safety and the environment.

## Technology 5 Designed For Maintainability

Eaton's EPSILON® designs allow for easy maintenance. Seals, stems, and bearings can be replaced to keep the connections performing like new.

\* Hastelloy® is a registered trademark of Haynes Internations, Inc.



# Design/Materials of Construction

Wetted components are available in either 316 Stainless Steel or Hastelloy®.

Spring Energized and Spring Loaded Teflon® PTFE, TFM, or PFA U-Cup seals and seats. Each U-Cup seal is energized with a Hastelloy Alloy C276 slant coiled spring to provide initial sealing, including reverse pressure

(each coupling is rated to full vacuum). With the U-Cup design, load is increased on the sealing surface as internal pressure increases.

**PTFE**  
Excellent chemical compatibility, excellent sealing characteristics (Fugitive emissions less than 25ppm at operator exposable distance).

Will operate in temperatures ranging from -40° to 250°F (120°C).

**TFM**  
Next generation PTFE with best combination of temperature ranging from -40° to 500°F (260°C), sealing, and sliding characteristics.

**PFA**  
Best chemical compatibility, best sealing characteristics (Zero fugitive emissions at operator exposable distance\*). Will operate in temperatures ranging from -40° to 250°F (120°C).

\*Below limit of analytical detection.

\*Teflon® is a registered trademark of E.I. du Pont de Nemours and Company.

**WARNING:** Due to the variety of chemicals that these couplings may be used to transfer, the user is responsible to verify the compatibility of the coupling body and the seal materials with the chemical being conveyed.

## Performance Characteristics

Valve Size	Spillage	Maximum Emissions	Flow Rate GPM (l/min)	C <sub>v</sub>	Max Working Pressure psi (bar)	Weight - lbs (kg)		Temp = °F (°C)		
						Adapter	Coupler	Min	Max PTFE & PFA	Max TFM
1-inch	<0.7 ml	<25ppm	50 (189)	42	300 (20)†	2.7 (1.2)	3.0 (1.4)	-40 (-40)	250 (121)	500 (260)
2-inch	<0.8 ml	<25ppm	150 (568)	160	300 (20)†	4.0 (1.8)	6.0 (2.7)	-40 (-40)	250 (121)	500 (260)
3-inch	<2 ml	<25ppm	300 (1135)	240	150 (10)†	16.0 (7.3)	19.0 (8.6)	-40 (-40)	250 (121)	500 (260)

†TUV approved for 10 bar Maximum Working Pressure

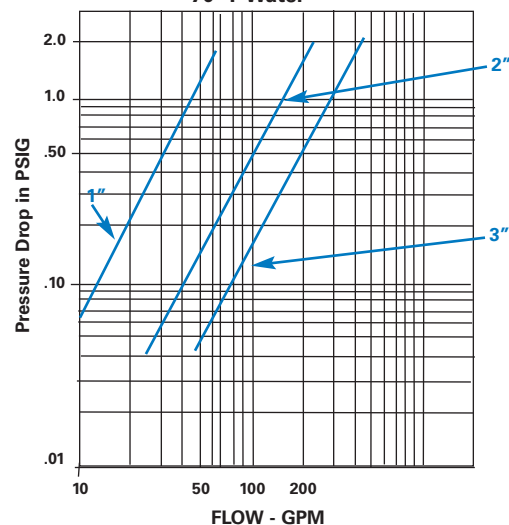
The features of the Eaton EPSILON® dry disconnect coupling are extensive. The charts provide the specifics of these features.

70°F water with 1.0 psi, pressure drop across the valve, 2" coupling features C<sub>v</sub> of 160.

- Flow rates from 50 GPM for the 1" to 300 GPM for the 3" product line. This coupling will keep up with the demand, whatever your application.
- Flow coefficient (C<sub>v</sub>) for valves. Flow rate shown in gallons per minute of

- Fugitive emissions of less than 25ppm, is standard. In most cases, it is below the limit of analytical detection.

**Pressure Drop vs. Flow**  
1", 2" & 3" Eaton EPSILON® Coupling  
Flow vs. Pressure Drop  
70° F Water



## Valve Size

EPSILON® coupling can be attached to hose or pipe sizes ranging from 3/4" to 3" or DN 20 to DN 80. There are three different valve body sizes that are machined to accept the different sizes and different connection types. The chart

shown indicates the valve body size that would be used with a given port size.

Valve Size	Port Size
1"	3/4", 1", DN 20 or DN25 Port
2"	1 1/2", 2", DN 40 or DN 50 Port
3"	3" or DN 80 Port

# Port Type

Standard port types are:

- |  |  |   |             |
|--|--|---|-------------|
| A - Female NPT (Pipe Thread)               | D - ANSI 150 lb. Flange                | K - DIN EN 1092-1/11 (B2 Facing), PN16  | N - JIS 10K |
| B - Female BSP (Whitworth Straight Thread) | E - ANSI 300 lb. Flange                | L - DIN EN 1092 -1/11 (B1 Facing), PN40 |             |
| C - Sch. 40 Butt Weld                      | F - Tri-Clover Flange                  | M - DIN 11850 Butt Weld                 |             |
|  | G - ANSI 600 lb. Flange                |   |             |
|  | J - DIN EN 1092-1/11 (B1 Facing), PN16 |   |             |

## Approvals

Eaton EPSILON® couplings are approved by TUV, AAR and CRN. UL approval is available upon request.



(Association of American Railroads) approved Eaton EPSILON® couplings.



(Underwriters Laboratories) Couplings are available, which are UL approved for liquified petroleum gas applications (including butadiene service). Contact Eaton

for additional information concerning UL approvals.

**CRN** (Canadian Registration Number) issued by TSSA for Eaton EPSILON® couplings.



Rheinland approved Eaton EPSILON® couplings.

## Part Number Descriptions

**Example Part Number = ZE 16 H S 16 A 00001**

Eaton Part Number Prefix

(Base Valve Size in Sixteenths an inch)  
 16 = 1 inch  
 32 = 2 inches  
 48 = 3 inches

System Half

- A = Adapter Half
- H = Hose Half (or coupler half)
- U = Adapter Half with Ultra low spill face seal

Material of Construction

- S = 316 Stainless Steel
- H = Hastelloy® C276 (wetted components)
- A = All Hastelloy® C276 Construction

Attaching End Port Size in Sixteenths of an inch

- 12 = 3/4 inch (DN 20)
- 16 = 1 inch (DN 25)
- 24 = 1 1/2 inch (DN 40)
- 32 = 2 inches (DN 50)
- 48 = 3 inches (DN 80)

Attaching End Port Type

- A = Female NPT (Pipe Thread)
- B = Female BSP Thread
- C = Sch. 40 Butt Weld
- D = ANSI 150 lb. Flange
- E = ANSI 300 lb. Flange
- F = Tri-Clover (sanitary flange)
- G = ANSI 600 lb. Flange
- J = DIN EN 1092-1/11 (B1 Facing), PN16
- K = DIN EN 1092-1/11 (B2 Facing), PN16
- L = DIN EN 1092 -1/11(B1 Facing), PN40
- M = DIN 11850 Butt Weld
- N = JIS 10K

Five digit sequential number

## Additional Features

The following addresses some special product features designed for customers with unique requirements.

### Ultra Low Spill Face Seal

This seal reduces the amount of spillage at disconnect to .2 cc. This seal is not pressure assisted and should only be used for applications lower than 100 psi.

### Keyed Couplings

Keyed interface mechanically locks-out and isolates transfer lines, preventing cross contamination of fluids. Available for all sizes.

### Cavity Filled

Designed to reduce the possibility of contamination by entrapment of process fluid in the void normally found behind the ball and the valve body. Ideal for application where

cross contamination and cleanliness is a concern. Back side of the valve balls are bored for efficient cleaning. Available for all sizes.

### Handle Assembly

Available to assist in handling 3" hose assembly.

### Heavy Duty Swivel

Designed for a high amount of side load and impact resistance. Available for 2" valve size only. Standard on 1" and 3" size valves.

### Polyethylene Dust Cap

Used to protect the ball from damage and debris when coupling is closed and disconnected.

### Stainless Steel Pressure Cap

Used to increase level of safety when coupling is closed, disconnected and under operating pressure.

## Transportation Coupling System (TCS)



Specially designed for railcar, truck, isotainer or tote equipment used in transporting chemicals safely. Contact us for more information.

### UL Approved Coupling

LP-Gas transfer applications, 270 psi LPG. Available for 1" and 2" valve sizes only.

## Heat Jackets

Used to maintain constant temperature even at the interface. More information is available upon request.

Contact Eaton or your nearest distributor for additional information regarding these or other special feature requests.



## A Comparison With Other Couplings

Performance Items	Eaton EPSILON (standard version)	Eaton EPSILON (enhanced performance version)	Block & Bleed	Split Butterfly	Poppet
Open Port	Yes	Yes	Yes	No	No
Advertised spillage on disconnect	<0.7 ml	<0.2 ml	up to 8 L	<1 ml	<1 ml
Positive shut-off both sides	Yes	Yes	No	No	No
Safety interlocks	Yes	Yes	No	Yes	No
Lock-out capability	Yes	Yes	No	No	No
Fugitive VOC emissions	<25ppm	ZERO*	extreme	<100ppm	<500ppm
Need abatement equipment	No	No	Yes	No	Yes
Frequent/costly maintenance	No	No	Yes	Yes	Yes
Connect/disconnect under full pressure	Yes	Yes	No	No	No

\*Below limit of analytical detection

## Eaton EPSILON® Operating Instructions

### OPENING of the Eaton EPSILON COUPLINGS:

First open the HOSE half/Coupler (C) :

1. Push in on Hub Pin (red arrow (a)) and
2. Turn the handle (1) 90° clockwise.

Then open the Adapter (A):

3. Push in on Hub Pin (red arrow (b)) and
4. Turn the handle (2) 90° clockwise.

### CLOSING of the Eaton EPSILON COUPLINGS:

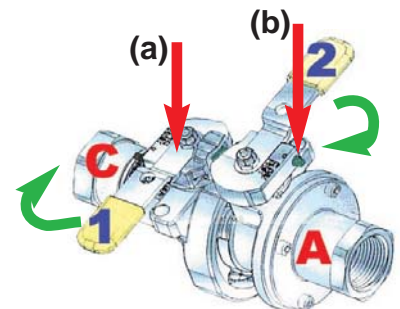
First close the Adapter (A):

1. Push in on Hub Pin (red arrow (b)) and

2. Turn handle (2) 90° counter clockwise.

Then close the Hose half/Coupler (C):

3. Push in on Hub Pin (red arrow (a)) and
4. Turn the handle (1) 90° counter clockwise.



## Economic Benefits

Eaton EPSILON® couplings provide an increase in process yields because spilling is eliminating. Additional significant economic benefits from the dry-disconnect coupling design are also achieved because the product:

- Eliminates the cost,

installation and maintenance of abatement equipment

- Reduces the need for costly personal protection gear
- Eliminates chemical waste incineration and disposal costs (waste management)

- Reduces liability exposure, loss time and worker comp claims
- Lowers insurance rates
- Provides faster connection for improved up-time
- Eliminates process downtime
- Helps maintain com-

pliance with the Clean Air Act Amendment's Hazardous Organic NESHAP\*\* (HON) emissions requirements for virtually all solvents.

\*\*National Emission Standards for Hazardous Air Pollutants

## Warranty

Eaton warrants, a period of one year from the date of original delivery, its products to be free from defects in materials and workmanship. This warranty does not apply to coupling seals or to any subsequent equipment owners.

Eaton's obligation under this warranty is limited to repair or replacement at its factory or authorized distributor of any part or parts of said products which shall be returned to Eaton with transportation charges prepaid and which Eaton's examina-

tion shall disclose to its satisfaction to have been defective. This is Eaton's sole warranty and EATON MAKES NO OTHER WARRANTY, EXPRESS OR IMPLIED. EATON HEREBY DISCLAIMS THE IMPLIED WARRANTY OF MERCHANTABILITY AND THE IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.

Eaton neither assumes nor authorizes any persons to assume for it, any other obligation in connection with the sale of Eaton's products. This warranty shall not apply to any product or component

thereof which has been repaired or altered outside of Eaton's factory in any manner, so as, in Eaton's judgment, to affect its service ability or which has been subjected to misuse, negligence or accident, or to products made by Eaton which have been operated in a manner contrary to Eaton's printed instructions. Under no circumstances shall Eaton be liable for loss, damage, cost of repair, or consequential damages of any kind in connection with the sale, use or repair of any product purchased from Eaton.

## Contact Us

**Take the next step - learn how the Eaton EPSILON® coupling and containment system can improve your fluid transfer operations.**

Our design and application engineers are uniquely trained to assist you in solving your most difficult fluid containment challenges. We offer the tools and a trained sales staff to quantify user value, conduct a complete cost-benefit analysis, and calculate an accurate return on investment projection.

To see the Eaton EPSILON® coupling and containment system first-hand, visit our web site at [http://www.aerospace.eaton.com/products/fluid\\_conveyance/epsilon/index.html](http://www.aerospace.eaton.com/products/fluid_conveyance/epsilon/index.html). You can also reach us by phone at 706-779-7545 or by fax at 706-779-3752.

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