



EPSILON[™]
DRY DISCONNECT PRODUCTS

OPW Fluid Transfer Group, part of OPW Fluid Transfer Group, provides expert solutions for the safe handling, transfer, monitoring, measuring and protection of hazardous bulk products worldwide.



OPW Fluid Transfer Group (OPWFTG), organized in 1998 and part of the Dover Corporation (NYSE:DOV), is comprised of six market-leading operating companies—each dedicated to designing, manufacturing and distributing world class solutions that assist in safe handling and transporting of hazardous bulk products. In addition to these companies, OPWFTG has operations in North America, Europe and Asia.

We invite you to learn more about us by visiting our operating companies' Web sites, and discover the many ways we can help safeguard your products, people and the environment—and add value to your bottom line.

THE EPSILON™ COUPLING SYSTEM

The EPSILON™ coupling system was designed to prevent chemical spills and reduce fugitive emissions of volatile organic compounds (VOC's), particularly in the process facility and during transfer to and from truck tanks and railroad tank cars. During in-plant chemical transfers, EPSILON™ Chemical Containment System will provide your plant with process flexibility while also improving operator safety and enhancing environmental compliance and reducing overall capital expenditures and operating costs.

EPSILON™ is a low spill coupling, based on a double ball valve system integrating a sophisticated safety design in sizes of 1", 2" and 3". The design is constructed to handle a pressure of 25 Bar and temperature up to 240°C and is available with end connections complying to DIN and ANSI standards.

All wetted materials are 316 stainless steel (1.4401) with TFM or PFA seals. Haselloy® C is also available for use with more aggressive fluids.

Beyond the common advantages of a ball valve design, EPSILON™ provides for flow through an unrestricted flowpath and double shut off reliability in the coupling connection.



Manifold station with EPSILON™ adapters.

SAFETY:

EPSILON™ coupling is equipped with safety interlocks, which force the valves to open and close only with a deliberate action, preventing accidental opening of the valve.

ENVIRONMENT:

EPSILON™ is a low spill system, specified to less than 1 ml spillage for the 2" coupling (2000 cycles test average 0.6 ml) and less than 0.7 ml for the 1" coupling.

MAINTENANCE:

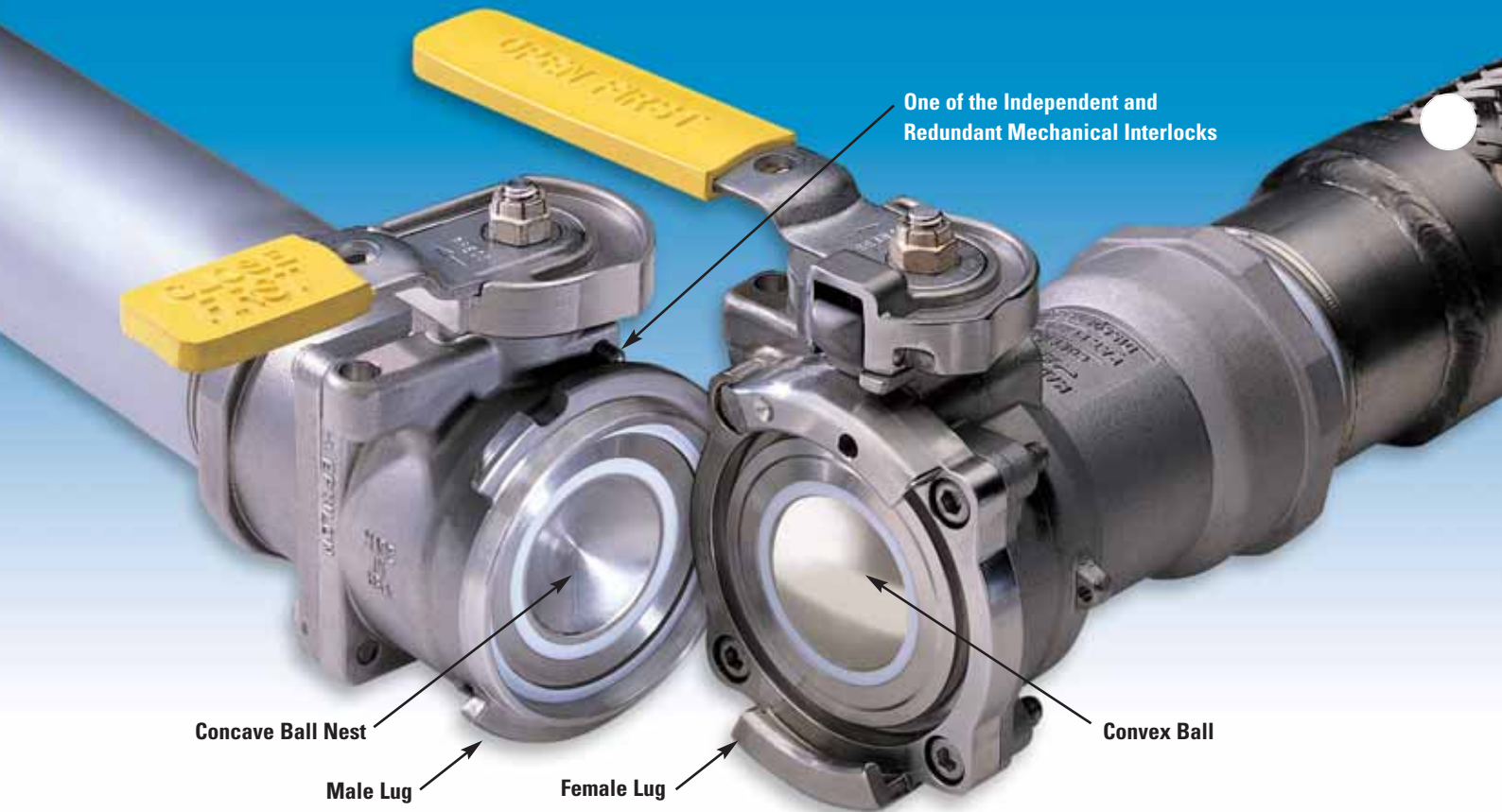
EPSILON™ was not only engineered for easy operations, but also for quick replacement of the transfer seal without any lockout. No special tools are required for replacement of seals.



FEATURE

BENEFIT

Concave/Convex Ball Valve Construction	
Small cavity between mating halves	<ul style="list-style-type: none"> • Minimizes fluid exposure during uncoupling • Allows coupling disconnection under pressure
Positive shut-off on both mating halves	<ul style="list-style-type: none"> • Prevents accidental release of potentially hazardous fluids
Straight-through flow path	<ul style="list-style-type: none"> • Provides unrestricted high flow in either direction • Minimizes pressure drop
Wetted surfaces are 316 stainless steel or Hastelloy® alloy	<ul style="list-style-type: none"> • Significantly reduces corrosion in caustic environments
Spring Energized/Spring Loaded PTFE Seals	
Energized PTFE spring seals provides load for all sealing surfaces	<ul style="list-style-type: none"> • Insures ultra low emissions even at low media pressures • Broad chemical/media compatibility • Robust sealing capability for extended use (connect/disconnect cycles)
Male to Female Interface Connections use a Lug and Flange Design	
Ramped Lug and Flange interfaces	<ul style="list-style-type: none"> • Provides easy alignment of mating valves for connection
Quarter turn locking mechanism	<ul style="list-style-type: none"> • Eliminates the need for special tools • Easy coupling connection • Eliminates cross threads and over tightening
Independent and Redundant Safety Locks	
Redundant mechanical interlocks	<ul style="list-style-type: none"> • Eliminate accidental coupling disconnection during media transfer • Allows for safe coupling disconnection even under full transfer pressure • Stops catastrophic chemical release • Improves worker safety



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.

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, minimize 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 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®.

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.



Spring-Energized and Spring-Loaded Teflon® 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. Testing confirms that the ultra low spillage and emission specifications are still achieved after 2,000 cycles.



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.

* Teflon® is a Registered Trademark of DuPont.



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



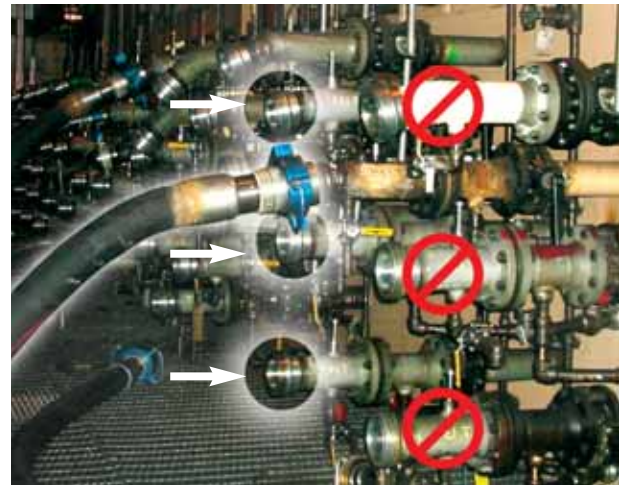
Transportation Coupling System (TCS)

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



Polyethylene Dust Cap

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



Keyed Couplings

For extremely critical operations, EPSILON™ offers the unique Keyed interface which locks out and isolates transfer lines, preventing cross-contamination.



Stainless Steel Pressure Cap

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

Designed for Maintainability

OPW Engineered Systems' EPSILON™ designs allow for easy maintenance. Seals, stems and bearings can be replaced to keep the connections performing like new.

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

Spring Energized and Spring Loaded Teflon® TFM or PFA U-Cup seals and seats. Each U-Cup seal is energized with a Hastelloy 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.

TFM

Next generation PTFE with best combination of temperature ranging from -40° to 500°F (240°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 (-40°C to 121°C).

*Below limit of analytical detection.

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.

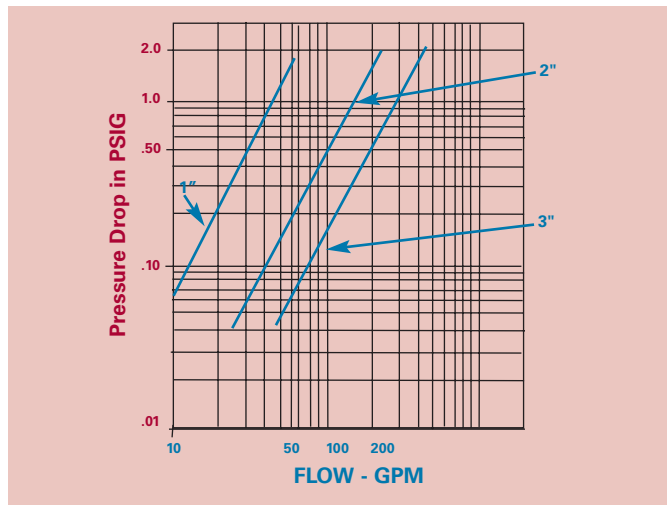
Performance Characteristics

Valve Size	Spillage	Maximum Emissions	Flow Rate GPM (l/min)	Cv	Max Working Pressure psi (bar)	Weight - lbs (kg)		Min	Temp = °F (°C)	
						Adapter	Coupler		Max PTFE and PFA	Max TFM
1-inch	<0.7 ml	<25 ppm	50 (189)	42	360 (25)	2.7 (1.2)	3.0 (1.4)	-40 (-40)	250 (121)	500 (240)
2-inch	<0.8 ml	<25 ppm	150 (568)	160	360 (25)	4.0 (1.8)	6.0 (2.7)	-40 (-40)	250 (121)	500 (240)
3-inch	<2 ml	<25 ppm	300 (1135)	240	360 (25)	16.0 (7.3)	19.0 (8.6)	-40 (-40)	250 (121)	500 (240)

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

- 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 (Cv) for valves. Flow rate shown in gallons per minute of 70°F water with 1.0 psi, pressure drop across the valve, 2" coupling features (Cv) of 160.
- Fugitive emissions of less than 25 ppm, is standard. In most cases, it is below the limit of analytical detection.

Pressure Drop vs. Flow 1", 2" & 3" EPSILON™ Coupling
Flow vs. Pressure Drop - 70° F Water



Valve Size

EPSILON™ couplings 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-inch (DN25)	3/4", 1", DN 20 or DN 25 Port
2-inch (DN50)	1-1/2", 2", DN 40 or DN 50 Port
3-inch (DN80)	3" or DN 80 Port

Standard Port Types

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

Part Number Descriptions

Example Part Number =

ZE 32 A S 32 A 0 1 2 3 2

OPW Engineered Systems Part Number Prefix

Base Valve Size (in Sixteenths of an inch)

- 16 = 1" (DN 50)
- 32 = 2" (DN 50)
- 48 = 3" (DN 80)

System Half

- A = Adaptor half
- H = Hose half (or Coupler)
- U = Ultralow Spill

Material of Construction

- S = 316 Stainless Steel
- H = Hastelloy® C-276 (wetted components)
- A = All Hastelloy® C-276 Construction

End Connection Size

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

End Connection Type

- A = FNPT
- B = FBSP
- 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 2633 Form C
- K = DIN 2633 Form E
- L = DIN EN 1092 -1/11(B1 Facing), PN40
- M = DIN 11850 Range 1 Butt Weld
- N = JIS 10K
- P = DIN 11850 Range 2 Butt Weld
- Q = DIN 11850 Range 3 Butt Weld

Seal

- 1 = TFM
- 2 = PFA

Key

- 0 = None
- 1 = 1
- 2 = 2
- 3 = 3
- 4 = 4
- 5 = 5
- 6 = 2-3
- 7 = 2-3-4
- 8 = 3-4

Protective Cap

- 1 = Dust
- 2 = Pressure

Handle

- 1 = Standard
- 2 = Raised
- 3 = Long Coupler
- 4 = 6" Welded

Cavity Filler

- 0 = No
- 1 = Yes

Approvals

EPSILON™ couplings are approved/listed for pressure service through a comprehensive set of international agencies.

CRN

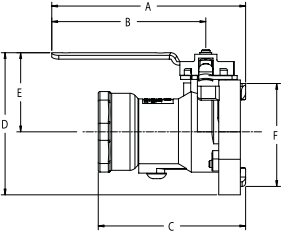
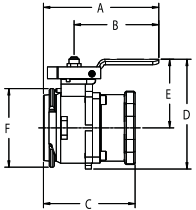
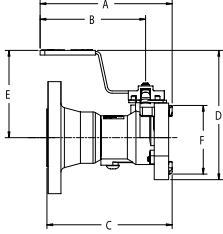
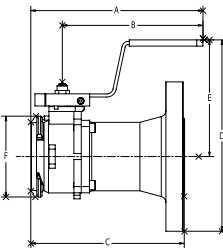
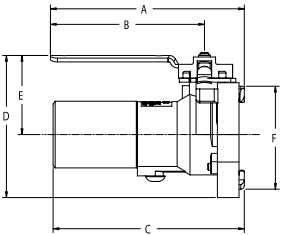
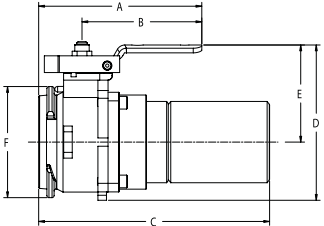
(Canadian Registration Number) issued by TSSA for EPSILON™ couplings.



(Association of American Railroads) approved EPSILON™ couplings.



Süd-Munich approved EPSILON™ couplings.

SI. No.	Type	Dimensional Data - in								
		Size	End Connection	A	B	C	D	E	F	
1		COUPLER HALF, NPT	1"	3/4"	4.7	3.6	4.2	4.5	2.7	3.4
		1"	1"	4.7	3.6	4.2	4.5	2.7	3.4	
		2"	1 1/2"	7.0	5.6	5.3	5.2	2.9	4.0	
		2"	2"	7.0	5.6	5.3	5.2	2.9	4.0	
		3"	3"	9.6	7.5	8.1	7.4	4.4	5.9	
2		ADAPTER HALF, NPT	1"	3/4"	4.5	3.6	3.3	4.3	2.7	2.7
		1"	1"	4.5	3.6	3.3	4.3	2.7	2.7	
		2"	1 1/2"	4.8	3.6	3.8	4.6	2.9	3.2	
		2"	2"	4.8	3.6	3.8	4.6	2.9	3.2	
		3"	3"	9.5	7.5	5.5	7.2	4.4	4.8	
3		COUPLER HALF, FLANGED 150 LBS ANSI	1"	3/4"	4.7	3.6	5.8	4.6	2.7	2.7
		1"	1"	4.7	3.6	5.8	4.8	2.7	2.7	
		2"	1 1/2"	7.0	5.6	6.8	7.2	4.7	4.0	
		2"	2"	7.0	5.6	6.8	7.7	4.7	4.0	
		3"	3"	9.6	7.5	10.8	8.2	4.4	5.9	
4		ADAPTER HALF, FLANGED 150 LBS ANSI	1"	3/4"	4.5	3.6	5.4	4.6	2.7	3.4
		1"	1"	4.5	3.6	5.4	4.8	2.7	3.4	
		2"	1 1/2"	4.8	3.6	6.3	5.4	2.9	3.2	
		2"	2"	4.8	3.6	6.3	6.0	2.9	3.2	
		3"	3"	9.5	7.5	8.2	8.9	5.2	4.8	
5		COUPLER HALF, BUTT WELD SCHEDULE 40	1"	3/4"	4.5	3.6	6.3	4.3	2.7	3.4
		1"	1"	4.5	3.6	6.3	4.3	2.7	3.4	
		2"	1 1/2"	4.8	3.6	6.8	4.6	2.9	3.2	
		2"	2"	4.8	3.6	6.8	4.6	2.9	3.2	
		3"	3"	9.5	7.5	8.5	7.4	4.4	4.8	
6		ADAPTER HALF, BUTT WELD SCHEDULE 40	1"	3/4"	4.5	3.6	6.3	4.3	2.7	3.4
		1"	1"	4.5	3.6	6.3	4.3	2.7	3.4	
		2"	1 1/2"	4.8	3.6	6.8	4.6	2.9	3.2	
		2"	2"	4.8	3.6	6.8	4.6	2.9	3.2	
		3"	3"	9.5	7.5	8.5	7.4	4.4	4.8	

Sl. No.	Type	Dimensional Data - mm							
		Size	End Connection	A	B	C	D	E	F
7	COUPLER HALF, BSP	1"	G 3/4"	119	91	107	114	69	86
		1"	G 1"	119	91	107	114	69	86
		2"	G 1 1/2"	178	142	135	132	74	102
		2"	G 2"	178	142	135	132	74	102
		3"	G 3"	244	191	206	188	112	150
8	ADAPTER HALF, BSP	1"	G 3/4"	114	91	84	109	69	69
		1"	G 1"	114	91	84	109	69	69
		2"	G 1 1/2"	122	91	97	117	74	81
		2"	G 2"	122	91	97	117	74	81
		3"	G 3"	241	191	140	183	112	122
9	COUPLER HALF, FLANGED DIN 2633	1"	DN20	142	115	131	152	95	86
		1"	DN25	142	115	131	152	95	86
		2"	DN40	180	144	155	202	120	102
		2"	DN50	180	144	155	202	120	102
		3"	DN80	244	191	274	208	112	122
10	ADAPTER HALF, FLANGED DIN 2633	1"	DN20	137	115	121	152	95	69
		1"	DN25	137	115	121	152	95	69
		2"	DN40	176	144	141	202	120	81
		2"	DN50	176	144	141	202	120	81
		3"	DN80	241	191	208	226	132	122
11	COUPLER HALF, WELD END DIN 2559	1"	20	114	91	160	109	69	69
		1"	25	114	91	160	109	69	69
		2"	40	122	91	173	117	74	81
		2"	50	122	91	173	117	74	81
		3"	80	241	191	216	188	112	122
12	ADAPTER HALF, WELD END DIN 2559	1"	DN20	114	91	160	109	69	69
		1"	DN25	114	91	160	109	69	69
		2"	DN40	122	91	173	117	74	81
		2"	DN50	122	91	173	117	74	81
		3"	DN80	241	191	216	188	112	122

OPW Fluid Transfer Group (OPWFTG), part of Dover Corporation (NYSE:DOV), is comprised of market-leading operating companies, each dedicated to designing, manufacturing and distributing world-class solutions for the safe handling and transporting of hazardous bulk products. In addition to these companies, OPWFTG has manufacturing plants in North America, Europe, Brazil and India; and sales offices in Singapore, and China.

Throughout the world, OPWFTG companies are hard at work ensuring the safe processing, loading, transporting and unloading of hazardous bulk products and safeguarding against costly petroleum and chemical spills, tank overfills and fugitive vapor emissions. Whether your need is in the chemical plant, at the terminal loading rack, or outfitting a fleet of rail tank cars, cargo tanks or dry-bulk trailers, OPWFTG systems set the standard for safety, performance and peace-of-mind assurance in the most rigorous and demanding applications. If the safe, profitable handling of hazardous liquids and dry bulk commodities such as gasoline and diesel, chlorine, chlor-alkali products, LPG, acids, cement, flour and starch, among others, is your concern, trust OPWFTG.

EXPERT SOLUTIONS FOR THE SAFE HANDLING & TRANSPORTING OF HAZARDOUS BULK PRODUCTS

	Applications	Processing	Load	Transporting		Unload
PETROLEUM	<ul style="list-style-type: none"> Gasoline Ethanol Alcohols Fuel Oil LPG 	<ul style="list-style-type: none"> Bellow Sealed Valves Sample Valves Lined Ball Valves Lined Butterfly Valves Industrial Valves ISO Rings Sight Flow Indicators Globe Valves Swivels Dry Disconnects 	<ul style="list-style-type: none"> Loading Arms Couplers Rack Monitors Dry Disconnects API Coupler Swivels 	Cargo Tanks <ul style="list-style-type: none"> Manholes Vapor Vents Electronics Internal Valves API Adaptors Sealed Parcel Pneumatic Controls Manifold Systems 	Rail Tank Cars <ul style="list-style-type: none"> Pressure Relief Valves Plug Valves Ball Valves Level Measurement Autoloks Kamvaloks Dryloks Rupture Disc Devices Angle Valves 	<ul style="list-style-type: none"> Drylok Couplers Adaptors Delivery Elbows Vapor Recovery Elbows Swivels
CHEMICALS	<ul style="list-style-type: none"> Chlorine Acids & Bases Amines Anhydrous Ammonia Propylene Butadiene Hazardous Liquids 	<ul style="list-style-type: none"> Bellow Sealed Valves Sample Valves Lined Ball Valves Lined Butterfly Valves Industrial Valves ISO Rings Sight Flow Indicators Globe Valves Swivels Dry Disconnects Quick Disconnects Epsilon 	<ul style="list-style-type: none"> Loading Arms Autoloks Kamvaloks Dryloks Loading Manholes Valves Actuators Swivels Epsilon 	Cargo Tanks <ul style="list-style-type: none"> Manholes Vapor Vents Electronics Internal Valves Sealed Parcel Epsilon 	Rail Tank Cars <ul style="list-style-type: none"> Pressure Relief Valves Plug Valves Ball Valves Level Measurement Autoloks Kamvaloks Dryloks Rupture Disc Devices Angle Valves Epsilon 	<ul style="list-style-type: none"> Loading Arms Autoloks Kamvaloks Dryloks Valves Actuators Safety Breakaways Swivels Epsilon
DRY BULK	<ul style="list-style-type: none"> Cement Flour/Starch Pharmaceuticals 	<ul style="list-style-type: none"> Industrial Valves Sight Flow Indicators Butterfly Valves Swivels 	<ul style="list-style-type: none"> Loading Arms Aerators Hatch Covers Swivels 	Cargo Tanks <ul style="list-style-type: none"> Manholes Check Valves Hopper Tees Butterfly Valves Aerators Weld Rings 	Rail Cars <ul style="list-style-type: none"> Manholes Hatches Access Ports Check Valves Hopper Tees Butterfly Valves Aerators Pressure Vacuum Valves 	<ul style="list-style-type: none"> Aerators Butterfly Valves Tank Hatches Pressure Relief Vacuum Relief Temperature Monitoring
INDUSTRIAL/GENERAL	<ul style="list-style-type: none"> Food Processing Pharmaceuticals Waste Water High-Purity Liquids Breweries Pulp and Paper Steel Processing 	<ul style="list-style-type: none"> Lined Ball Valves Lined Butterfly Valves Sample Systems Sight Flow Indicators ISO Rings Dry Disconnects Swivels Quick Disconnects High-Performance Butterfly Valves Epsilon 	<ul style="list-style-type: none"> Loading Arms Couplers Rack Monitors Swivels Dry Disconnects Quick Disconnects Butterfly Valves Epsilon 	Cargo Tanks <ul style="list-style-type: none"> Manholes Vapor Vents Electronics Weld Rings Hopper Tees Pneumatic Controls Sealed Parcel Dry Disconnects Epsilon 	Rail Tank Cars <ul style="list-style-type: none"> Safety Valves Plug Valves Ball Valves Level Measurement Autoloks Kamvaloks Dryloks Rupture Disc Devices Angle Valves Epsilon 	<ul style="list-style-type: none"> Loading Arms Couplers Rack Monitors Swivels Dry Disconnects Quick Disconnects Butterfly Valves Epsilon

Chemical & Industrial Processing Market Unit

- Food Processing
- Chemical Plants
- Petroleum Loading Stations
- Steel Processing, Pulp & Paper
- Waste Water Treatment
- Pharmaceutical
- Breweries
- High-Purity Liquids

Rail Market Unit

- Pressure & General Purpose Rail Tank Cars
- Dry Bulk Rail Cars
- Ethanol Rail Tank Cars

Cargo Tank Market Unit

- Gasoline & Diesel
- Dry Bulk
- Ethanol



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