Dry Disconnects Overview

OPW Engineered Systems offers the most comprehensive line of dry disconnect products in the industry. OPW's line of dry disconnects include Drylok™, Kamvalok® and Epsilon®, all suitable for a broad range of hazardous liquid applications.

Dry Disconnect coupling devices have been proven as successful technology to help protect workers and the environment in the transfer of hazardous materials. If your product is corrosive, toxic, caustic or otherwise harmful, **OPW Engineered System's** family of high-performance dry disconnect couplings reduces the hazard associated with the transfer of these products.

- **Kamvalok®** couplings can be used at any transfer point where product loss is unacceptable.
- **Drylok™** coupling systems are designed to safely transfer hazardous, corrosive, volatile liquids such as acids, solvents and petrochemicals.
- **Epsilon®** couplers are designed with a double ball valve system to prevent chemical spills and reduce fugitive emissions of VOCs.

Kamvalok® Overview

The Industry Standard in Dry Disconnect Couplings

The OPW Engineered Systems' Kamvalok® dry disconnect is designed to automatically shut off in the event of an accidental disconnection of the coupler and adaptor. Should the Kamvalok® be accidentally disconnected due to operator error or accident while the handle is in the open position and product flow is in progress, the poppet in the adaptor will automatically close and the seal cylinder will immediately stop flow through the coupler.

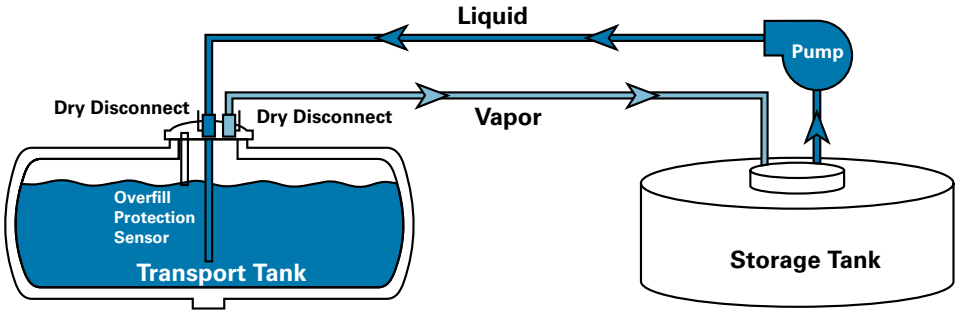
After the Kamvalok® adaptor and coupler are firmly coupled together, the coupler handle is turned to the OPEN position. This action moves the coupler poppet toward the adaptor poppet until the two mating poppets make contact. By completely turning the handle to the full open position the coupler poppet is extended beyond the end of the coupler, depressing the adaptor poppet back into the adaptor body. This creates clearance for the liquid flow around both the coupler and adaptor poppets. Guiding fins in the coupler and deflectors in the adaptor ensure even flow characteristics. When the handle is returned to the CLOSED position, the poppets are closed and the disconnection can be made. With the exception of the minimal amount of liquid captured between the two poppets, spillage upon disconnect is prevented.

Kamvalok® Applications

Because of its unique poppet action, the OPW Kamvalok® Dry Disconnect virtually eliminates spillage of any residual liquid contained within the line after disconnection. Kamvaloks® are used at transfer points where product loss is unacceptable. Common applications include: paint, lacquers, inks, adhesives, fatty acids, pharmaceuticals, liquid soaps, petroleum products, solvents, ag-chemicals, vegetable oils, detergents, and many acids and caustics.

OPW Engineered Systems' Kamvalok® Couplings and Adaptors Provide for Total Closed-Loop Loading Capabilities.

- Kamvalok® Dry Disconnect Couplings and Adaptors
- D2000™ Vapor Recovery Couplers
- Tank Trailer, Tank Car and IBC Dry Disconnect Adaptors
- Autolok®/Kamlock® Quick Couplings



The benefit of closed-loop loading is that it protects people and property from dangerous and costly exposure by keeping hazardous liquids and vapors in-line and out of the environment. Closed-loop loading can help you meet the guidelines of responsible product stewardship and be in compliance with the Clean Air Act, SARA TITLE III, OSHA and other regulations.

OPW Kamvalok® components allow you to create closed-loop configurations on railcars.

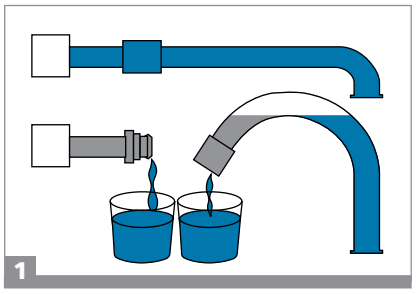
Genuine OPW Kamvalok® Dry Disconnect Couplings help prevent product loss from routine and accidental uncouplings.

Through OPW's global distribution network, producers can create closed-loop systems using authentic OPW Kamvalok® products.

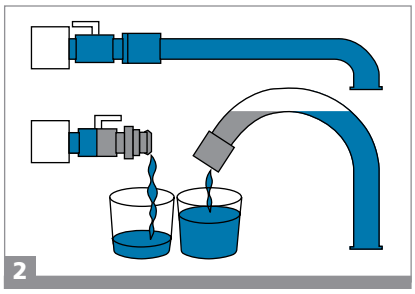
Major shippers of hazardous liquids choose specially designed fittings from OPW when converting tank car fleets.

Why Use Kamvaloks®

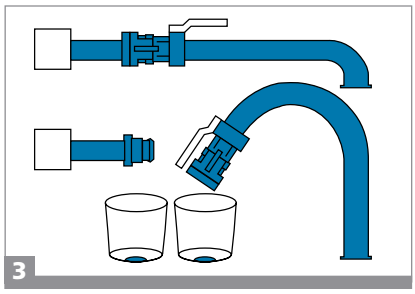
- If your product is corrosive, toxic, caustic or otherwise harmful, Kamvaloks® will reduce the hazard associated with the transfer of these products.
- If your product is a VOC (volatile organic compound) that has a high vapor pressure and tends to evaporate quickly, Kamvaloks® will keep the product in-line and out of the air.
- Kamvaloks® will contain fugitive emissions, transfer VOCs without vapor loss, help keep employees out of harm's way and help promote responsible environmental management.



Ordinary Quick Disconnect Couplings - Excessive amount of liquid spills out when coupling is disconnected.



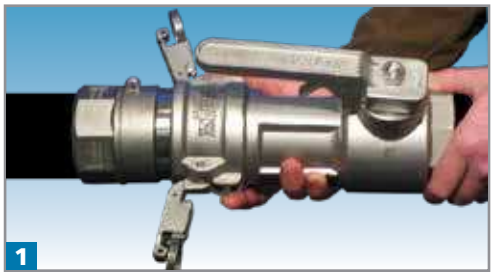
Ordinary Quick Disconnect Couplings Plus Ball Valve - Excessive amount of liquid spills out when coupling and ball valve are disconnected.



OPW Dry Disconnect Couplings - Virtually eliminates spillage of any residual liquid contained within the line after disconnection.

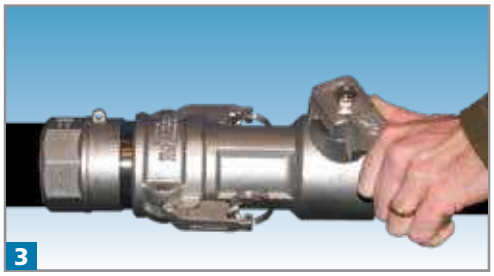
Kamvalok® Operation

OPW Engineered Systems' Kamvalok® Dry Disconnects are easy to operate. Connections and disconnections are accomplished by simply closing and opening two cam arms which lock into the machined groove around the circumference of the mating adaptor. The adaptor contains a spring-loaded poppet assembly that is actuated by the handle-action on the coupler.

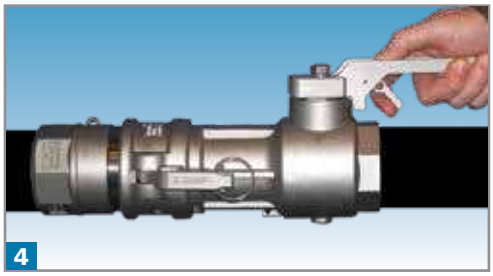


Coupler in any Position

Cam Arms Lock Coupler and Adaptor Together



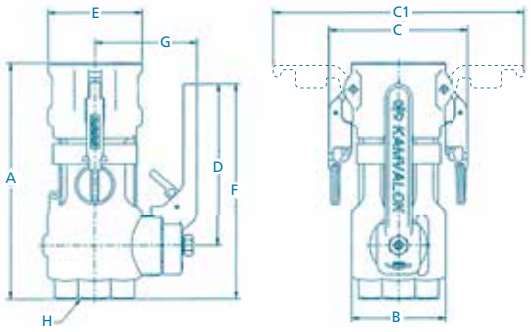
Locking Handle Opens Valves

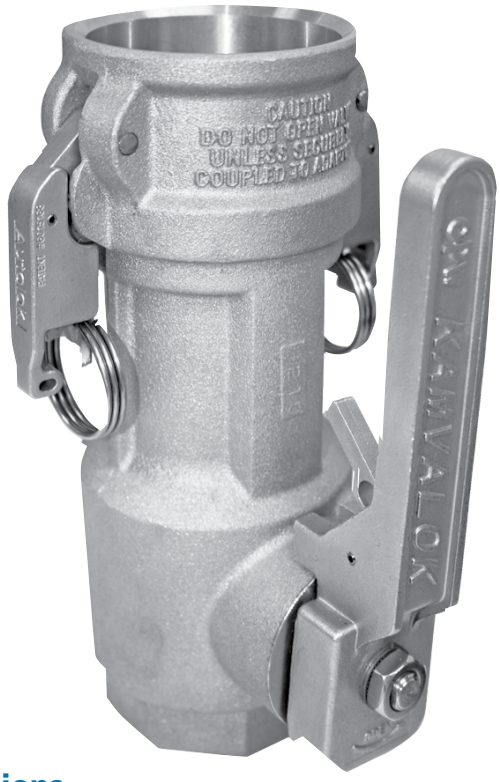


Handle Locks and Full Flow Begins

1700DL Series Couplers

OPW Kamvalok® Dry Disconnect Couplings are considered the standard of the industry. Used at liquid transfer points where product loss could occur, OPW Kamvaloks® provide a reliable solution to prevent spillage during connection or disconnection. OPW Kamvalok® Dry Disconnect Couplings are used by manufacturers of paint, lacquers, inks, adhesives, fatty acids, pharmaceuticals, liquid soaps, and many other liquid products. They are particularly well suited for handling petroleum products, solvents, ag-chemicals, vegetable oils, detergents and many acids and caustics.





Features & Benefits

- **Poppeted Seal Cylinder with Snap-on Nose Seal**
  - Keeps hazardous liquids in-line and out of the environment
  - Nose seal can be easily replaced without need for new seal cylinder
  - AUTOMATIC CLOSURE
- **Autolok® Locking Arms**
  - Provide added protection with an automatic locking mechanism
  - Uncoupling requires only an easy tug on the lock release
- **SST Locking Handle**
  - Handle locks in both the opened and closed positions to prevent accidental opening or closing of valve
- Refer to page 24 for Performance Specifications

Dimensions

SIZES IN INCHES (Approximate)		1 1/2"	2"	3"
A	Length of Body	8"	8.81"	10.03"
B	Diameter of Body	3.12"	3.52"	5.50"
C	Distance across Cam Arms – closed	4.75"	5.22"	7.34"
C1	Distance across Cam Arms – open	8.94"	9.41"	14.78"
D	Centerline of Shaft to end of Handle	6.06"	6.06"	6.06"
E	Diameter of Coupler End	3.12"	3.52"	5.50"
F	Length from Pipe End to end of Handle	7.98"	8.03"	8.56"
G	Centerline of Coupler to top of Handle	3.56"	3.75"	4.53"
H	Pipe Thread (NPT)	1.50" (DN40)	2" (DN50)	3" (DN80)

Ordering Specifications

TYPE
17 - Coupler

CONFIGURATION
1 - Aluminum Body, Duplex Stainless Steel Internals
7 - Stainless Steel Body, Duplex Stainless Steel Internals

SIZE
15 - 1-1/2" DN40
20 - 2" DN50
30 - 3" DN80

1711DL - AL15 - GL

STYLE
***** - Leave blank for FNPT
A - 150 lb. Flange
GL - Greaseless
KL- Keylok
T - 300 Lb. Flange

O-RING SEAL
1 - Buna-N
2 - Fluorocarbon
3 - PTFE
4 - EPDM
6 - Chemraz®

DL - FNPT
DBL - FBSPT

CONSTRUCTION MATERIAL
AL - Aluminum Body (ASTM A356-T6 B-26)
SS - Stainless Steel Body (ASTM A351 CF3M 316L)

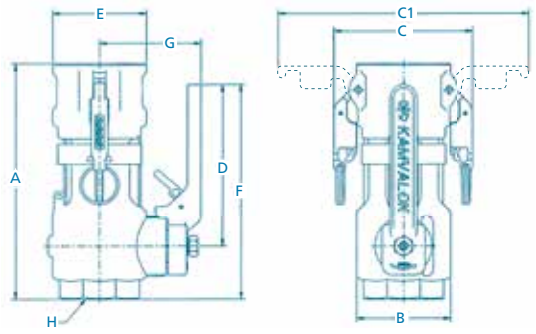
Kamvalok®
Flat-Face Coupler and Adaptor

The new Kamvalok® Flat-Face is the next generation of OPW dry-disconnect couplings. We've taken our proven, best-in-class Kamvalok and flattened the connection points. This effectively eliminates all cavities where liquid can pool and subsequently spill upon disconnection.

Features & Benefits

- Reduce product loss at disconnect by up to 85%
- New patent-pending smooth, flat-face poppets
- Industry-standard locking handle
- Easy to close Autolok™ locking arms
- Automatic locking arms, no pins or buttons
- Vibration-resistant Twin-Kam™ arms

Kamvalok® Flat-Face Dry Disconnect Couplings



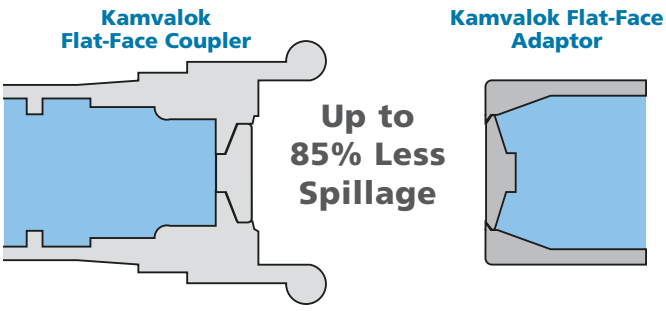
Dimensions

SIZES IN INCHES (Approximate)		1 1/2"	2"	3"
A	Length of Body	8"	8.81"	10.03"
B	Diameter of Body	3.12"	3.52"	5.50"
C	Distance across Cam Arms – closed	4.75"	5.22"	7.34"
C1	Distance across Cam Arms – open	8.94"	9.41"	14.78"
D	Centerline of Shaft to end of Handle	6.06"	6.06"	6.06"
E	Diameter of Coupler End	3.12"	3.52"	5.50"
F	Length from Pipe End to end of Handle	7.98"	8.03"	8.56"
G	Centerline of Coupler to top of Handle	3.56"	3.75"	4.53"
H	Pipe Thread (NPT)	1.50" (DN40)	2" (DN50)	3" (DN80)

Kamvalok® Flat-Face

Dry-Disconnect Coupler Design

Kamvalok Flat-Face reduces product loss at disconnect by **up to 85%** compared to our already high-performing standard Kamvalok.



*Percentage of fluid loss at disconnect varies depending on the size of the Kamvalok and if it is vertically or horizontally positioned.

Coupler Ordering Information

Type
17 - Coupler

Configuration
1 - Aluminum Body, Duplex Stainless-Steel Internals
7 - Stainless-Steel Body, Duplex Stainless-Steel Internals

Size
15 - 1-1/2" DN40
20 - 2" DN50
30 - 3" DN80

1711DL - AL15 - GL - FLAT*

Style
* - Leave blank for FNPT
A - 150-lb. Flange
GL - Greaseless
KL - Keylok
T - 300-lb. Flange

O-Ring Seal
1 - Buna-N
2 - Fluorocarbon
3 - PTFE
4 - EPDM
6 - Chemraz®

DL - FNPT
DBL - FBSPT

Construction Material
AL - Aluminum Body (ASTM A356-T6 B-26)
SS - Stainless-Steel Body (ASTM A351 CF3M 316L)

*** Simply add "FLAT" to the end of any standard Kamvalok Coupler Order**

Adaptor Ordering Information

Type
16 - Adaptor

Configuration
1 - Aluminum Body, Stainless-Steel Internals
7 - Stainless-Steel Body, Stainless-Steel Internals

Size
15 - 1-1/2" FNPT
20 - 2" FNPT
30 - 3" FNPT

1611AN - AL15 - GL - FLAT*

Style
GL - Greaseless
KG - Krytox Grease
KL - Keylok
P - Sanitary Triclamp

O-Ring Seal
1 - Buna-N
2 - Fluorocarbon (GFLT)
3 - PTFE / Silicone
4 - EPDM
6 - Chemraz®
7 - PTFE / Fluorocarbon

Connection
ANF - 150 lb. Flange
AN - Female NPT
ANFT - 300 lb. Flange
ABN - Female BSPT

Construction Material
AL - Aluminum Body
SS - Stainless-Steel Body

*** Simply add "FLAT" to the end of any standard Kamvalok Adaptor Order**

Design Parameters

Max Design Pressure	1-1/2" Size - 210 psig (15 bar) 2" Size - 150 psig (10.5 bar) 3" Size - 120 psig (8.5 bar)	
Temperature Range	• Buna-N	-20°F – 212°F (-29°C – 100°C)
	• Fluorocarbon	-20°F – 400°F (-29°C – 204°C)
	• PTFE Encapsulated Silicone	-15°F – 400°F (-26°C – 204°C)
	• EPDM	-50°F – 250°F (-46°C – 121°C)
	• Chemraz®*	-15°F – 400°F (-26°C – 204°C)

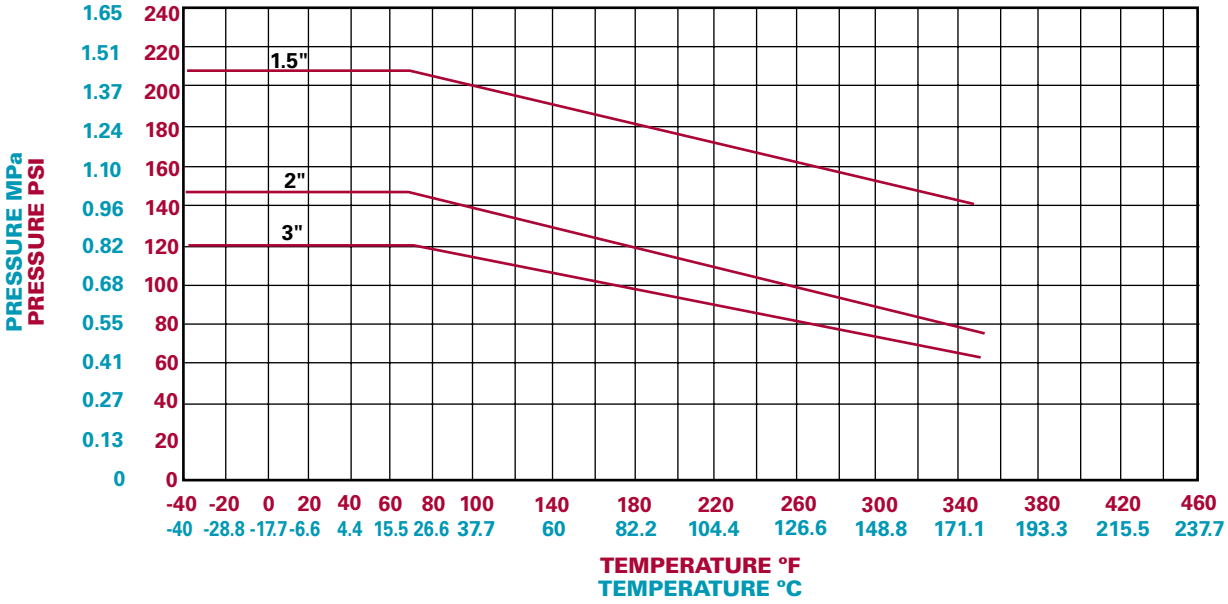
Materials

Body, Poppet, Seal Cylinder	Aluminum, Stainless Steel
Shaft Link, Cam Arms, Poppet Link	Stainless Steel

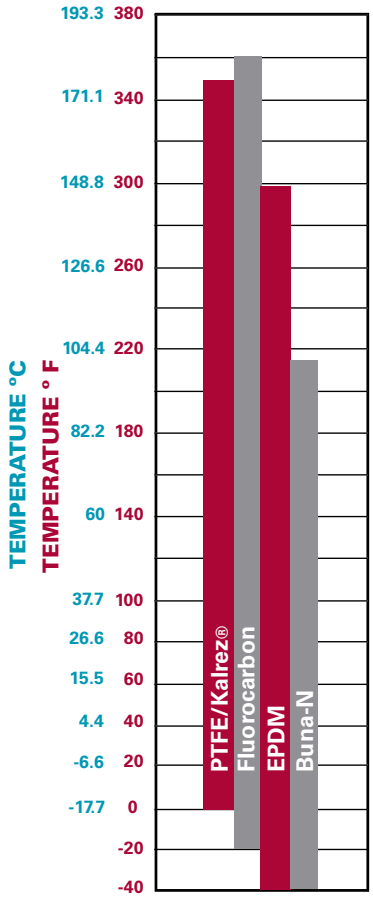
*Chemraz is a registered trademark of Greene-Tweed

1700DL Series & D2000™ Series

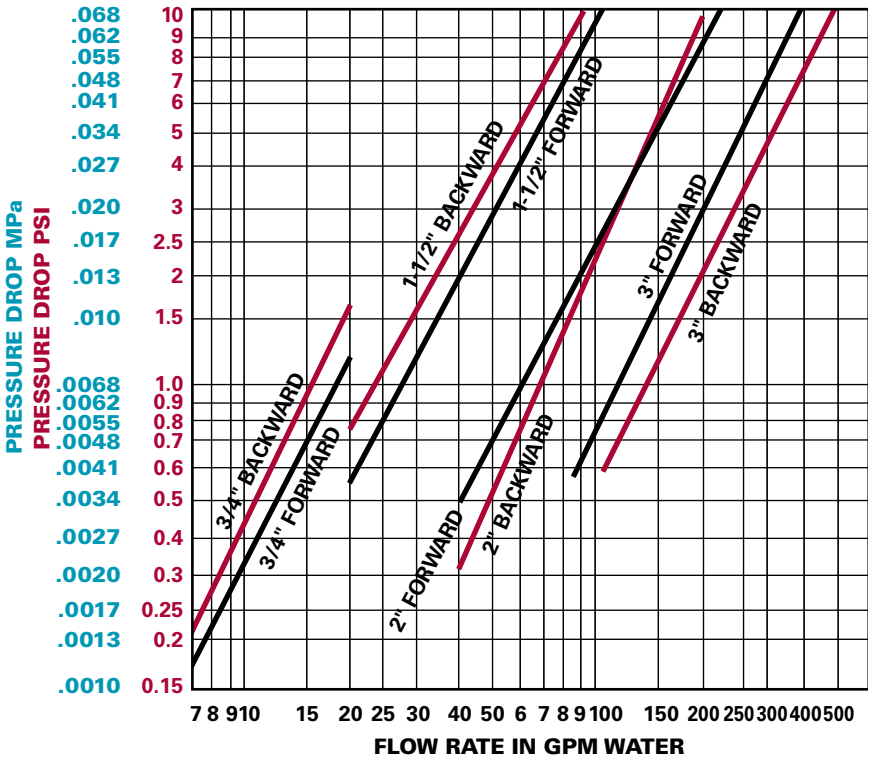
Temperature/Pressure Characteristics



Temperature Characteristics



Flow Characteristics



LEGEND:

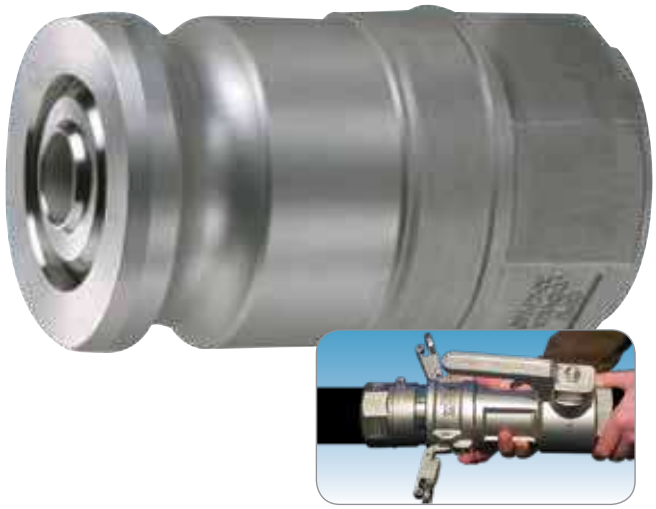
- Forward Flow From Coupler Through Adaptor
- Backward Flow From Adaptor Through Coupler

NOTE: For flow information on specific chemicals or liquid products, contact your OPW Representative or Factory Technical Customer Service.

OPW ENGINEERED SYSTEMS A DOVER COMPANY

1600AN

The 1600AN Series Adaptor is specifically designed to mate with OPW Kamvalok® Couplings to help prevent liquid spillage during the connection/disconnection process. The adaptor contains a spring-loaded poppet to assure fast closing and tight seal.



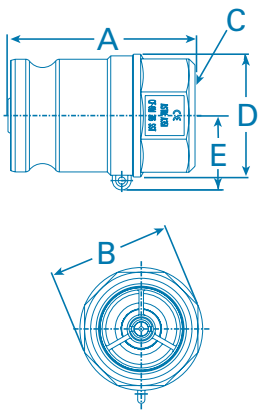
Benefits

- **Single Piece Design** – Eliminates a possible leak path.
- **Spill Prevention** – Poppet-actuated design can only be opened with a Kamvalok® coupling; designed to provide a tight seal when closed.
- **Reliability of Operation** – The simple spring-loaded poppet design and heavy-duty construction provide for reliable, long-life operation.
- **Optimum Flow Rate** – Even flow and low pressure drop are achieved by a built-in deflector that reduces turbulence.

Features

- **Heavy-Duty Construction** – Available in aluminum, and stainless steel construction. Stainless steel corrosion resistance comparable to 316 stainless steel.
- **Female Threads** – Can be fitted to either a male pipe end or to a hose fitting
- **Spring-Loaded Poppet Design** – Assures fast closing and tight seal
- **Wide Range of Seals** – Available in Buna-N, Fluorocarbon, PTFE, EPDM, Chemraz®

Dimensions



SIZE IN INCHES (Nominal)	1 1/2"	2"	3"
A	4-3/4"	4-15/16"	6-17/32"
B	2-1/2"	3-1/4"	4-1/2"
C	1-1/2"	2"	3"
D	2-21/32"	3-1/4"	4-7/8"

Ordering Specifications

TYPE
16 - Adaptor

CONFIGURATION
1 - Aluminum Body, Stainless Steel Internals
7 - Stainless Steel Body, Stainless Steel Internals

SIZE
15 - 1-1/2" FNPT
20 - 2" FNPT
30 - 3" FNPT

1611AN - AL15 - GL

STYLE
* Leave blank for FNPT
A - 150 lb. Flange
GL - Greaseless
KL- Keylok
T - 300 lb. Flange

O-RING SEAL
1 - Buna-N
2 - Fluorocarbon (GFLT)
3 - PTFE / Silicone
4 - EPDM
6 - Chemraz®
7 - PTFE / Fluorocarbon

CONNECTION
AN - FNPT
ABN - FBSPT
ANF - 150 lb. Flange
ANFT - 300 lb. Flange

CONSTRUCTION MATERIAL
AL - Aluminum Body
SS - Stainless Steel Body

1600ANF

The OPW 1600ANF Series Adaptors are designed specifically for applications using an ANSI flange.

The OPW 1673ANF, 1674ANF and 1676ANF Dry Disconnect Adaptors keep hazardous chemicals and vapors in-line and out of the environment.

Rugged, yet quick and easy to install, the 1600ANF Series is ideal for closed-loop loading conversions.

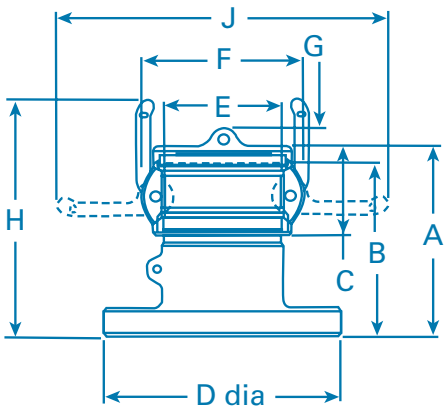
Benefits

- **Eliminates Threads - One less leak point**
- **Spill Prevention** – The poppet-actuated design can only be opened with a Kamvalok® coupling; designed to provide a tight seal when closed.
- **Easy Access Connection** – Provides easy connection access for tank cars, tank trucks, intermodal tanks and in-process operations.
- **Connects with D2000™ Actuating Coupler or Kamvalok® 1700 Series Dry Disconnect Couplings**
- **Easy Cleaning** – Can be quickly disassembled
- **Specifically designed for applications using ANSI flanges**

Features

- **Heavy-Duty Construction** – Stainless steel corrosion resistance, comparable to 316 stainless steel
- **Available with 150# raised face flange or 300# tongue and groove design**
- **Spring-Loaded Poppet Design** – Assures fast closing and tight seal
- **Available in a Range of Seals** – PTFE, EPDM, Chemraz®, Buna-N and Fluorocarbon.
- **Available in 1-1/2", 2" and 3" sizes**

1673ANF and 1673ANFT



SIZE IN INCHES (1670ANF)

	1/2 x 2"	2"	3"
A Overall Length	4-47/64"	4-29/32"	6-9/16"
B Length of Body	4-13/32"	4-31/64"	6-1/8"
C Length of Cap	2-5/64"	2-1/4"	2-5/16"
D Diameter of Flange	6"	6"	7-1/2"
E Diameter of Body	2-1/2"	3"	4-45/64"
F Width of Cap	3-9/16"	4-1/16"	5-33/64"
G Height of Chain Lug	1/2"	7/16"	1/2"
H Length with Arms	6-1/32"	6-3/32"	8-1/8"
Number of Bolt Holes	4	4	4
Diameter of Bolt Holes	3/4"	3/4"	3/4"
Diameter of Bolt Circle	4-3/4"	4-3/4"	6"
J Max width of Arms	7-1/8"	8"	11-3/32"

SIZE IN INCHES (1670ANFT)

	2"	3"
A Overall Length	5-5/32"	6-13/16"
B Length of Body	4-47/64"	6-6/8"
C Length of Cap	2-1/4"	2-5/16"
D Dia. of Flange	6-1/2"	8-1/4"
E Dia. of Body	2-63/64"	4-45/64"
F Width of Cap	4-1/16"	5-33/64"
G Height of Chain Lug	7/16"	1/2"
H Length with Arms	6-21/64"	8-3/8"
Number of Bolt Holes	8	8
Diameter of Bolt Holes	3/4"	7/8"
Diameter of Bolt Circle	5"	6-5/8"
J Maximum width of Arms	8-9/32"	11-3/32"