ROTARY UNION®

DESIGN GUIDE

Duff-Norton®

PRODUCT DISCLAIMER

The function of a rotating union is to separate the working media from the environment. Duff-Norton Rotary Union® brand of rotating unions are contacting seal type rotating unions and will allow leakage to some degree, as will all similarly designed and manufactured products. It is important to note the leakage of rotating unions will increase over time as the contacting seals wear. All persons specifying, installing and operating the rotating union must take note of this potential risk. The information in this catalog is supplied upon the condition the persons using Duff-Norton products will make their own determination whether this leakage may be dangerous, unsafe or cause damage of any nature whatsoever.

In no event may Duff-Norton be held responsible for unsafe operating practices of those employing Duff-Norton equipment. Users must be knowledgeable of the rotating union application and the product must never be operated outside the operating parameters given throughout this design guide. Duff-Norton Rotary Unions must not be used on media not specified in this design guide. If one is unsure about the safety of operating a rotating union in a particular application, it is strongly advised to contact Duff-Norton Engineering for assistance in determining suitability in the application.

NOTE

Duff-Norton has made every effort to ensure that the information contained in this publication is accurate and reliable. Determining the suitability of our products for specific applications is the user's responsibility.

WARNING

The equipment shown in this catalog is intended for industrial use only and should not be used to transfer media that is hazardous or toxic. Duff-Norton does not endorse the use of these products in a manner that is inconsistent with its intended use.

Duff-Norton®

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What is a Rotary Union®?

A Rotary Union transfers media (water, steam, air, oil, Hydraulic fluid, etc) from a stationary source to rotating machinery, such as a drum or an indexing table.

How do I choose the best Rotary Union for my process?

Tell us about your process. We need to know:

1. Type of fluid or gas to be conveyed (Media).
2. Pressure (PSI).
3. Temperature (°F).
4. Speed (RPM).
5. Shaft connection (Thread size and type or flange size).
6. Flow rate of media (GPM).
7. Flow passage - mono flow or dual flow (if dual flow: stationary or rotating siphon pipe or tube).

Rotary Union Selection Guide

Media					Pressure* (PSI)	Temperature* (°F)	Speed* (RPM)	Thread Size	Rotary Union Series	Catalog Page
Water	Steam	Hot Oil	Air	Hydraulic Fluid						
YES			YES	YES	117	250	3,500	1/8" to 1/4"	300 Series	**6**
YES		YES	YES		150	375	500	2" to 4" Flange	2000 Series	**20**
	YES	YES			175	600	600	1/2" to 4"	8000 Series	**24**
YES	YES	YES			250	600	700	1/4" to 3"	9000G Series	**30**
YES	YES	YES			250	375	700	1/4" to 3"	9000 Series	**14**
YES			YES		290	392	Swivel	2" to 12"	1300 Series	**58**
YES			YES	YES	725	392	60	1/4" to 3"	1100 Series	**48**
YES	YES	YES	YES		750	300	1,000	1/4" to 2"	5000 Series	**10**
YES			YES	YES	1,160	392	90	1/4" to 6"	1102 Series	**52**
YES			YES	YES	2,900	250	1,500	1/4" to 1"	1600 Series	**38**
YES			YES	YES	2,900	250	1,500	1/4" to 1"	1650 Series	**40**
YES			YES	YES	3,625	250	1,500	1/4" to 1"	600 Series	**8**
YES			YES	YES	5,075	248	80	1/4" to 3"	1700 Series	**60**
YES			YES	YES	5,075	392	Swivel	1/4" to 2"	1200 Series	**56**
YES			YES	YES	5,800	392	3,000	1/4" to 1/2"	500 Series	**42**
YES			YES	YES	5,880	248	3,000	1/8" to 1-1/4"	HPMC / HSMC	**34**
YES			YES	YES	10,150	248	100	1/4" to 3"	1900 Series	**62**

**See performance charts for each Rotary Union for detailed performance data.*

Rotating Joint Application Analysis Form

Duff-Norton®

Duff-Norton engineers will be pleased to make recommendations for your specific requirements. Complete this form and mail or fax it to Duff-Norton Company. There is no obligation for this service.

Customer: _____

Address: _____

_____

Phone Number: _____ **Fax Number:** _____

Contact: _____

1. **Size Required:** _____ **or Estimated Flow Required:** _____

2. **Connection** (check one): ☐ Threaded Shaft ☐ Quick Release ☐ Flange Mount

If Threaded Shaft, specify
Type: ☐ NPT ☐ UNF ☐ BSP ☐ ISO228 ☐ Metric
Direction: ☐ Left Hand ☐ Right Hand
If Flange Mount, then refer to Flange Mountings, page 63 of catalog.

3. **Pressure:** _____ psi or _____ bar **Temperature:** _____ F° or _____ C°
Does pressure or temperature fluctuate or change during operation? If so, please give maximum, minimum and describe. _____

4. **Speed:** _____ **RPM** or _____ **Feet Per Minute** & **Diameter of Roll:** _____
Does direction alternate? ☐ Yes ☐ No

5. **Media to be Used:** ☐ Water ☐ Steam ☐ Air ☐ Hot Oil ☐ Hydraulic Oil (specify type) _____
☐ Other (specify) _____
Is medium abrasive, corrosive, flammable, explosive or toxic? If so, please explain: _____

_____

6. **Check One:** ☐ Single Flow ☐ Dual Flow ☐ Multiport
If Dual Flow, specify syphon size: _____ **& Type:** ☐ Stationary* ☐ Rotating
***If Stationary syphon, specify connection type:**
☐ Threaded† ☐ Tube
†If Threaded, specify type: ☐ NPT ☐ ISO228
☐ Other _____
If Multiport, specify number of ports: _____ **& Port Size** _____

7. **Rod Supported Joints:** Rod Spacing ("N" Spacing) _____ **Rod Diameter** _____
8. **Balancer (Compensator):** ☐ Yes ☐ No
9. **How many are being used now?** _____ **Potential Usage?** _____
10. **Is Competitive Joint being used now?** _____ **Manufacturer:** _____ **Model or Type:** _____
Any problems? Please describe: _____

_____

11. Any other information regarding application and requirements of the rotating joint. Send Sketches or Drawings if available. _____

_____

Please mail or fax completed sheet

If you have any questions or are in need of assistance please call our Application Engineers:

Phone: 1(800) 477-5002 • **Fax:** (704) 588-1994 • **Email:** duffnorton@cmworks.com

P.O. Box 7010 • Charlotte, NC 28241-7010 • FAX 704-588-1994
www. duffnorton.com

Duff-Norton UL REGISTERED FIRM ISO 9001 #A2574

APPLICATIONS

PRINTING
Ink-Feed Rolls, Ink Vibrator Rolls, Chill Rolls, Unwind Stands

RUBBER
Banbury Mixers, Extrusion Machines, Tubers, Calendars

STEEL
Run Out Tables, Benders, Sections, Reduction Mills, Un-Coilers, Re-Coilers

TEXTILES
Breaker Rolls, Slashers, Dry Can Ranges, Singers, Embossers

TIRES
Banbury Mixers, Warming Mills, Feed Mills, Sizing Mills, Custom Tire Processing Machines

PLASTICS
Extrusion Machines, Polishing Mills, Re-Winders, Dicers, Scrap Choppers, Scrap Recyclers

FOOD
Cereal Processing Flaking Mills, Shredders, Puffers, Cookers, Sugar Crystallizers









300 SERIES

SMALL ENVELOPE

GENERAL PURPOSE

Operating Parameters

MEDIA
Air, Water

PRESSURE*
117 PSI

TEMPERATURE*
250° F

SPEED*
3,500 RPM

THREADS
- 1/8" to 1/4" NPT
- Machine Thread
- BSP & BSPP Available

MATERIAL
Nickel Plated Steel

** See Performance Charts For Details*

Features & Benefits

High Speed Air & Water Applications

Ideal for high speed air and water applications with space constraints.

Small Profile

Small envelope dimensions make the 300 Series suitable for use in applications with space constraints.

Corrosion Resistant

All steel parts are nickel plated steel for corrosion resistance.

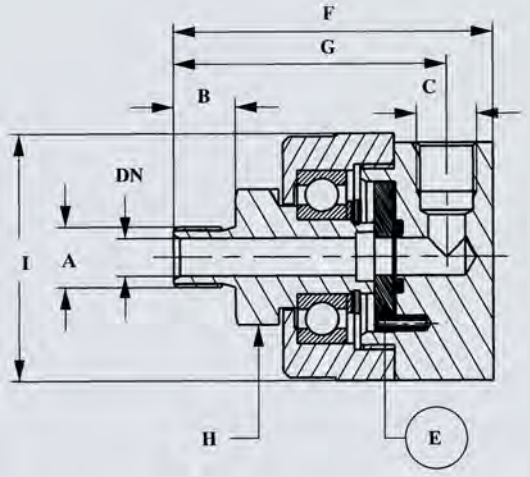
PART NUMBERS

300 SERIES ROTARY UNIONS					
		Right Hand Thread		Left Hand Thread	
	Shaft Thread (A)	Part Number	Description	Part Number	Description
	1/8 NPT	770359C	R3S3747KNPT	770358C	L3S3747KNPT
	1/4 NPT	770357C	R3S2086KNPT	770356C	L3S2086KNPT
	5/8-18 UNF	770361C	R3S3862KUNF	770360C	L3S3862KUNF

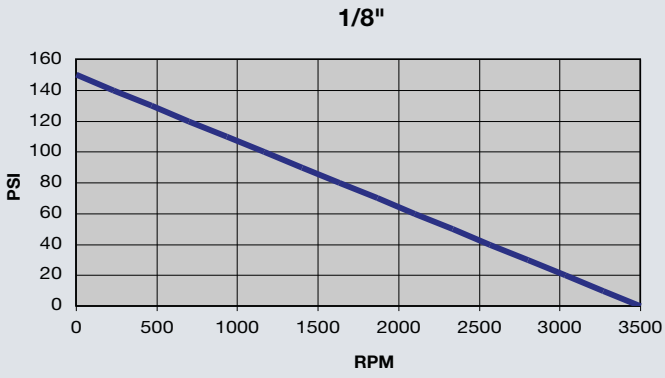
* E (Seal) 731271C

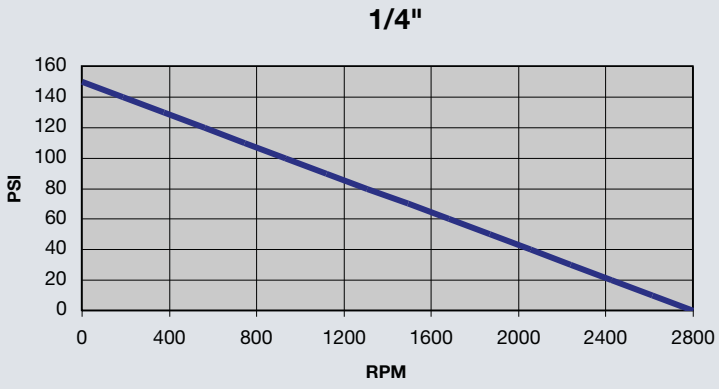
DIMENSIONS	Shaft Thread (A)	B	Inlet C (NPT)	DN	F	G	H	I
300 SERIES ROTARY UNIONS (in.)	1/8 NPT	0.4	1/8 (RH)	0.15	2	1.7	.75	1.5
	1/4 NPT	0.5		0.23				
	5/8-18 UNF	0.4		0.23				

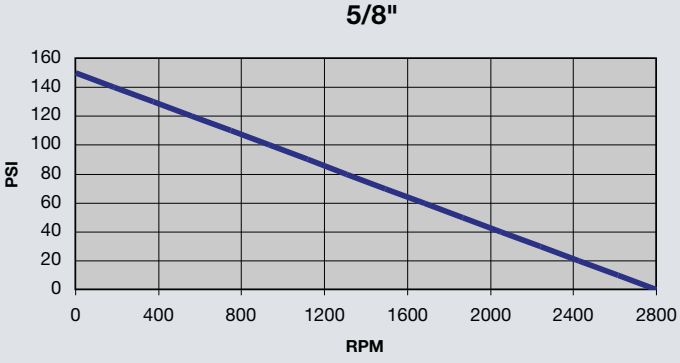
* E (Seal) 731271C



Performance Charts







Air & Water

600 SERIES

GENERAL PURPOSE

Operating Parameters

MEDIA
Water, Air, Hydraulic Fluid

PRESSURE*
3,625 PSI

TEMPERATURE*
250° F

SPEED*
1,500 RPM

THREADS
- 1/4" to 1" NPT or MT
- BSP & BSPP Available

MATERIAL
Nickel Treated Carbon Steel Construction. Stainless Steel Models Also Available.

CONFIGURATION OPTIONS
Mono Flow Configurations

** See Performance Charts For Details*

Features & Benefits

Two Configurations Offered

Either axial (straight through) nickel plated housing or radial (90 degree) inlet with aluminum housing for maximum flexibility.

Wide Range Of Sizes

Available in sizes from 1/4" to 1" NPT & MT.

High Speeds

Suitable for speeds up to 1,500 RPM.

Bi-Directional Rotation

The 600 Series is equipped with a GR seal design that allows bi-directional rotation.

600 SERIES ROTARY UNIONS

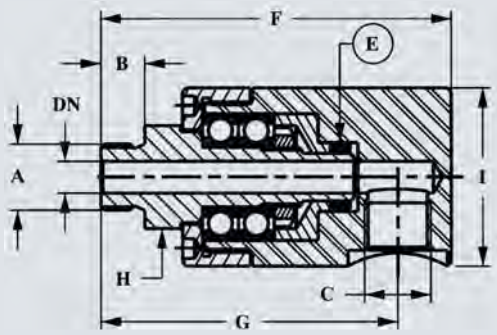
PART NUMBERS

Nominal Pipe Size	Shaft Thread (A)	Axial Inlet				Radial Inlet			
		Right Hand Thread		Left Hand Thread		Right Hand Thread		Left Hand Thread	
		Part Number	Description	Part Number	Description	Part Number	Description	Part Number	Description
1/4	1/4 NPT	**770363C**	R613JKANPT	**770362C**	L613JKANPT	**770383C**	R713JKRNPT	**770382C**	L713JKRNPT
	5/8-18 UNF	**770365C**	R613MKAUNF	**770364C**	L613MKAUNF	**770385C**	R713MKRUNF	**770384C**	L713MKRUNF
3/8	3/8 NPT	**770367C**	R617JKANPT	**770366C**	L617JKANPT	**770387C**	R717JKRNPT	**770386C**	L717JKRNPT
	5/8-18 UNF	**770369C**	R617MKAUNF	**770368C**	L617MKAUNF	**770389C**	R717MKRUNF	**770388C**	L717MKRUNF
1/2	1/2 NPT	**770371C**	R621JKANPT	**770370C**	L621JKANPT	**770391C**	R721JKRNPT	**770390C**	L721JKRNPT
	3/4-16 UNF	**770373C**	R621MKAUNF	**770372C**	L621MKAUNF	**770393C**	R721MKRUNF	**770392C**	L721MKRUNF
3/4	3/4 NPT	**770375C**	R627JKANPT	**770374C**	L627JKANPT	**770395C**	R727JKRNPT	**770394C**	L727JKRNPT
	3/4-16 UNF	**770377C**	R627MKAUNF	**770376C**	L627MKAUNF	**770397C**	R727MKRUNF	**770396C**	L727MKRUNF
1	1 NPT	**770379C**	R634JKANPT	**770378C**	L634JKANPT	**770399C**	R734JKRNPT	**770398C**	L734JKRNPT
	1-1/2-12 UNF	**770381C**	R634MKAUNF	**770380C**	L634MKAUNF	**770401C**	R734MKRUNF	**770400C**	L734MKRUNF

DIMENSIONS

600 SERIES AXIAL INLET (in.)

Nominal Pipe Size	Shaft Thread (A)	B	Inlet Thread C (NPT)	DN	Seal Design (E)	Overall Length (F)	Flats (H)	Outside Diameter (I)
1/4	1/4 NPT 5/8-18 UNF	.47	1/4	.19	466787C	2.79	.74	1.49
3/8	3/8 NPT 5/8-18 UNF	.43	3/8	.31	466789C	3.14	1.06	1.77
1/2	1/2 NPT 3/4-16 UNF	.55	1/2	.51	466792C	4.05	1.25	2.36
3/4	3/4 NPT 3/4-16 UNF	.70	3/4	.70	466794C	5.35	1.37	2.95
1	1 NPT 1-1/2-12 UNF	.74	1	.86	466792C	6.41	1.73	3.70



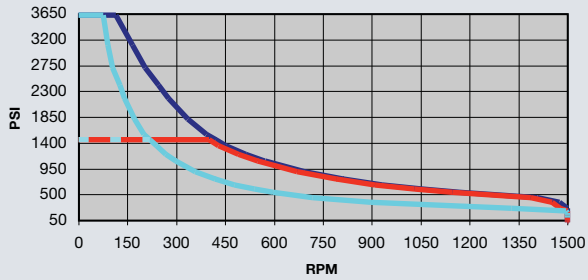
DIMENSIONS

600 SERIES RADIAL INLET (in.)

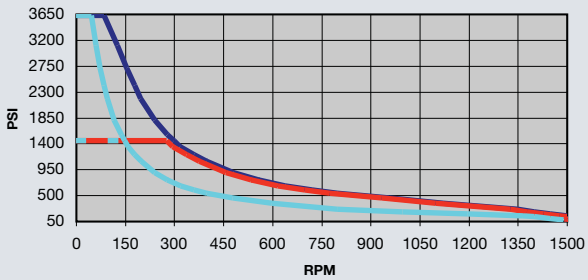
Nominal Pipe Size	Shaft Thread (A)	B	Inlet Thread C (NPT)	DN	Seal Design (E)	Overall Length (F)	Radial Design (G)	Flats (H)	Outside Diameter (I)
1/4	1/4 NPT 5/8-18 UNF	.47	1/4	.19	466787C	2.79	2.26	.74	1.49
3/8	3/8 NPT 5/8-18 UNF	.43	3/8	.31	466789C	3.14	2.93	1.06	1.77
1/2	1/2 NPT 3/4-16 UNF	.55	1/2	.51	466792C	4.05	3.48	1.25	2.36
3/4	3/4 NPT 3/4-16 UNF	.70	3/4	.70	466794C	5.35	4.56	1.37	2.95
1	1 NPT 1-1/2-12 UNF	.74	1	.86	466792C	6.41	5.35	1.73	3.70

Performance Charts

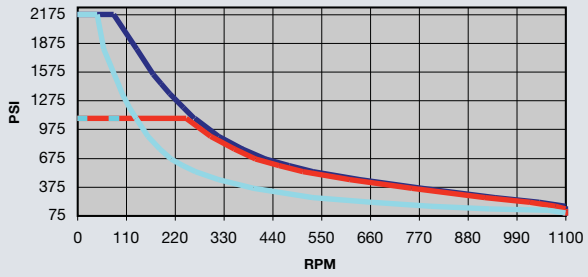
1/4"



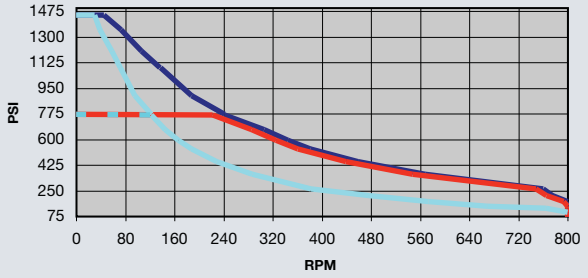
3/8"



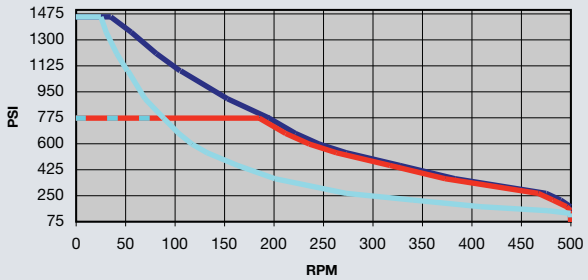
1/2"



3/4"



1"



Performance charts are for oil, grease or similar lubricating media. For media such as water or air, reduce the maximum recommended speed as follows:

For water, multiply speed by 0.67
For air, multiply speed by 0.33

Maximum recommended speeds are found on the horizontal axis.

Steel Axial Connection
Steel Radial Connection
Stainless Steel
Stainless Steel Radial Connection

805 SERIES

GENERAL PURPOSE

Operating Parameters

MEDIA
Air, Hydraulic Fluid, Water, Non-Toxic Gasses, Oil

TEMPERATURE*
320° F

THREADS
- 1/4" to 1" NPT
- MT & Metric
- BSP & BSPP Available

CONFIGURATION OPTIONS
Mono Flow and Dual Flow Configurations Available

PRESSURE*
435 PSI

SPEED*
5,000 RPM

MATERIAL
Aluminum Housing With A Stainless Steel Shaft. Also Available In All Stainless Steel Construction.

** See Performance Charts For Details*

Features & Benefits

Flexible
Suitable for a wide range of applications.

Mono Flow Models
Offered in sizes 1/4" to 1".

Dual Flow Models
Offered in sizes 1/2" to 1".

Seal Options
Two seal options are offered:

- **Seal Option E1** (Standard)
  The carbon graphite seal ring against ceramic face ring design can be used at pressures up to 435 psi.
- **Seal Option E2** (Consult Factory)
  The stainless steel seal ring against ceramic face ring design can be used at pressures up to 725 psi.

805 SERIES ROTARY UNION • MONO FLOW

PART NUMBERS

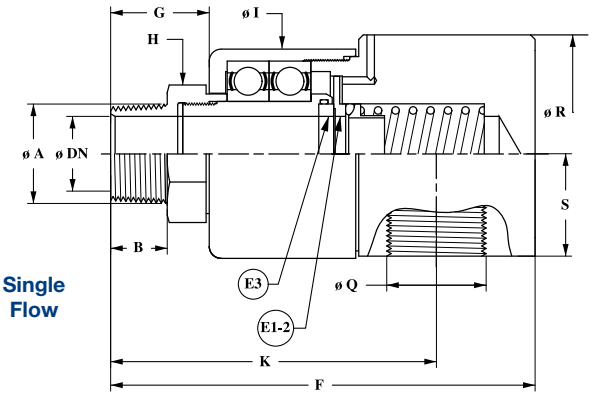
Nominal Pipe Size	Shaft Thread (A)	Right Hand		Left Hand	
		Part Number	Description	Part Number	Description
1/4	1/4 NPT	**760150C**	R813SR5NPT	**760155C**	L813SR5NPT
	1/4 BSP	**760152C**	R813SR5BSP	**760157C**	L813SR5BSP
	1/4 BSPP	**760153C**	R813SR5BSPP	**760158C**	L813SR5BSPP
	5/8-18 UNF	**760151C**	R813SR5UNF	**760156C**	L813SR5UNF
	M14xP1.5	**760154C**	R813SR5M	**760159C**	L813SR5M
3/8	3/8 NPT	**760170C**	R817SR5NPT	**760175C**	L817SR5NPT
	3/8 BSP	**760172C**	R817SR5BSP	**760177C**	L817SR5BSP
	3/8 BSPP	**760173C**	R817SR5BSPP	**760178C**	L817SR5BSPP
	5/8-18 UNF	**760171C**	R817SR5UNF	**760176C**	L817SR5UNF
	M16xP1.5	**760174C**	R817SR5M	**760179C**	L817SR5M
1/2	1/2 NPT	**760190C**	R821SR5NPT	**760195C**	L821SR5NPT
	1/2 BSP	**760192C**	R821SR5BSP	**760197C**	L821SR5BSP
	1/2 BSPP	**760193C**	R821SR5BSPP	**760198C**	L821SR5BSPP
	3/4-16 UNF	**760191C**	R821SR5UNF	**760196C**	L821SR5UNF
	M22xP1.5	**760194C**	R821SR5M	**760199C**	L821SR5M
3/4	3/4 NPT	**760210C**	R827SR5NPT	**760215C**	L827SR5NPT
	3/4 BSP	**760212C**	R827SR5BSP	**760217C**	L827SR5BSP
	3/4 BSPP	**760213C**	R827SR5BSPP	**760218C**	L827SR5BSPP
	1-1/16-12 UNF	**760211C**	R827SR5UNF	**760216C**	L827SR5UNF
	M25xP1.5	**760214C**	R827SR5M	**760219C**	L827SR5M
1	1 NPT	**760230C**	R834SR5NPT	**760235C**	L834SR5NPT
	1 BSP	**760232C**	R834SR5BSP	**760237C**	L834SR5BSP
	1 BSPP	**760233C**	R834SR5BSPP	**760238C**	L834SR5BSPP
	1-1/2-12 UNF	**760231C**	R834SR5UNF	**760236C**	L834SR5UNF
	M35xP1.5	**760234C**	R834SR5M	**760239C**	L834SR5M

805 SERIES ROTARY UNION • DUAL FLOW

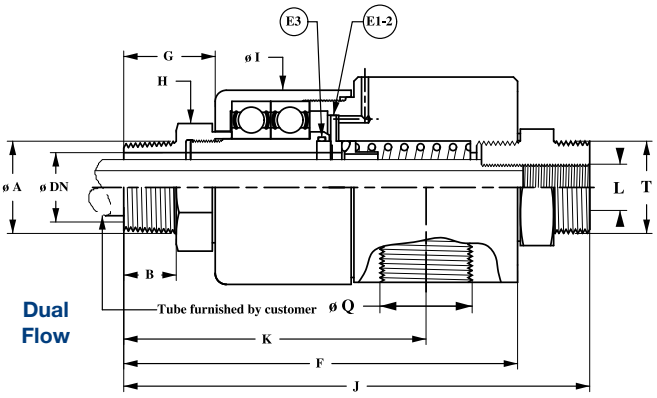
PART NUMBERS

Nominal Pipe Size	Shaft Thread (A)	Right Hand Thread		Left Hand Thread	
		Part Number	Description	Part Number	Description
1/2	1/2 NPT	**760250C**	R921SR5NPT	**760255C**	L921SR5NPT
	1/2 BSP	**760252C**	R921SR5BSP	**760257C**	L921SR5BSP
	1/2 BSPP	**760253C**	R921SR5BSPP	**760258C**	L921SR5BSPP
	3/4-16 UNF	**760251C**	R921SR5UNF	**760256C**	L921SR5UNF
	M22xP1.5	**760254C**	R921SR5M	**760259C**	L921SR5M
3/4	3/4 NPT	**760270C**	R927SR5NPT	**760275C**	L927SR5NPT
	3/4 BSP	**760272C**	R927SR5BSP	**760277C**	L927SR5BSP
	3/4 BSPP	**760273C**	R927SR5BSPP	**760278C**	L927SR5BSPP
	1-1/16-12 UNF	**760271C**	R927SR5UNF	**760276C**	L927SR5UNF
	M25xP1.5	**760274C**	R927SR5M	**760279C**	L927SR5M
1	1 NPT	**760290C**	R934SR5NPT	**760295C**	L934SR5NPT
	1 BSP	**760292C**	R934SR5BSP	**760297C**	L934SR5BSP
	1 BSPP	**760293C**	R934SR5BSPP	**760298C**	L934SR5BSPP
	1-1/2-12 UNF	**760291C**	R934SR5UNF	**760296C**	L934SR5UNF
	M35xP1.5	**760294C**	R934SR5M	**760299C**	L934SR5M

Single Flow



Dual Flow



805 SERIES ROTARY UNION • MONO FLOW (in.)

DIMENSIONS

Nominal Pipe Size	Shaft Thread (A)	Inlet Thread (Q)*	Shaft Thread Length (B)	DN	F	G	H	I	K	R	S
1/4	1/4 NPT	NPT	0.43	0.31	3.14	.74	.86	1.49	2.55	1.73	.76
	1/4 BSP	BSP									
	1/4 BSPP	BSPP			3.34	.94			2.75		
	5/8-18 UNF	NPT									
	M14xP1.5	BSP									
3/8	3/8 NPT	NPT	.43	.39	3.42	.82	1.02	1.65	2.71	1.81	.78
	3/8 BSP	BSP									
	3/8 BSPP	BSPP			3.62	1.02			2.91		
	5/8-18 UNF	NPT									
	M16xP1.5	BSP									
1/2	1/2 NPT	NPT	.55	.55	4.17	.98	1.25	2.16	3.38	2.36	1.02
	1/2 BSP	BSP									
	1/2 BSPP	BSPP			4.37	1.18			3.58		
	3/4-16 UNF	NPT									
	M22xP1.5	BSP									
3/4	3/4 NPT	NPT	.62	.78	4.80	1.10	1.37	2.48	3.74	2.91	1.29
	3/4 BSP	BSP									
	3/4 BSPP	BSPP			5.19	1.49			4.13		
	1-1/16-12 UNF	NPT									
	M25xP1.5	BSP									
1	1 NPT	NPT	.74	.98	5.59	1.22	1.61	2.75	4.25	3.14	1.33
	1 BSP	BSP									
	1 BSPP	BSPP	.70		5.98	1.61			4.64		
	1-1/2-12 UNF	NPT									
	M35xP1.5	BSP									

* All inlet threads are right hand threads

805 SERIES ROTARY UNION • DUAL FLOW (in.)

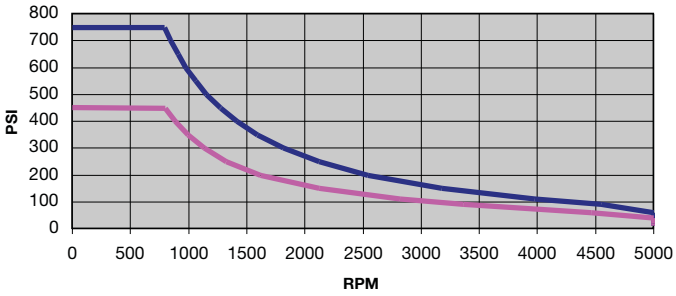
DIMENSIONS

Nominal Pipe Size	Shaft Thread (A)	Inlet Thread (Q)*	Shaft Thread Length (B)	DN	F	G	H	I	J	K	L (NPT)	R	S	T (NPT)
1/2	1/2 NPT	NPT	.55	.55	4.17	.98	1.25	2.16	5.23	3.38	1/8	2.36	1.02	.50
	1/2 BSP	BSP												
	1/2 BSPP	BSPP			4.37	1.18			5.43	3.58				
	3/4-16 UNF	NPT												
	M22xP1.5	BSP												
3/4	3/4 NPT	NPT	.62	.78	4.80	1.10	1.37	2.48	5.94	3.74	1/4	2.91	1.29	.75
	3/4 BSP	BSP												
	3/4 BSPP	BSPP			5.19	1.49			6.33	4.13				
	1-1/16-12 UNF	NPT												
	M25xP1.5	BSP												
1	1 NPT	NPT	.74	.98	5.59	1.22	1.61	2.75	6.85	4.25	3/8	3.14	1.33	1
	1 BSP	BSP												
	1 BSPP	BSPP	.70		5.98	1.61			7.24	4.64				
	1-1/2-12 UNF	NPT												
	M35xP1.5	BSP												

* All inlet threads are right hand threads

Performance Charts

1/4"



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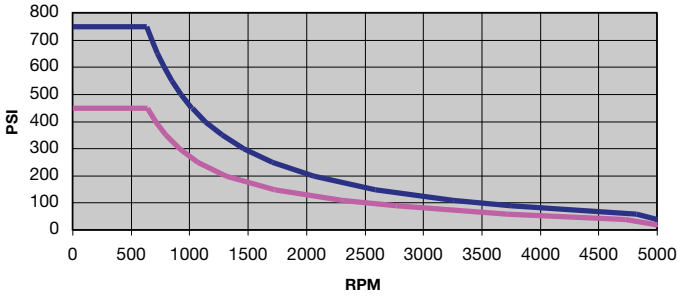

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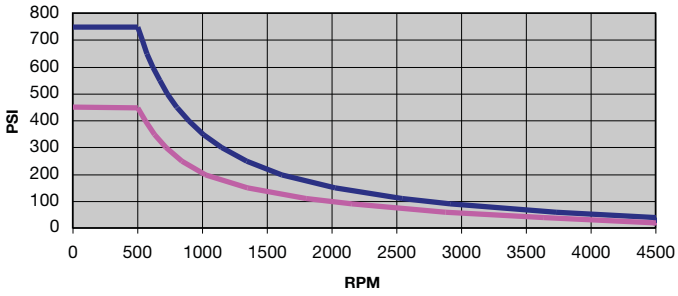

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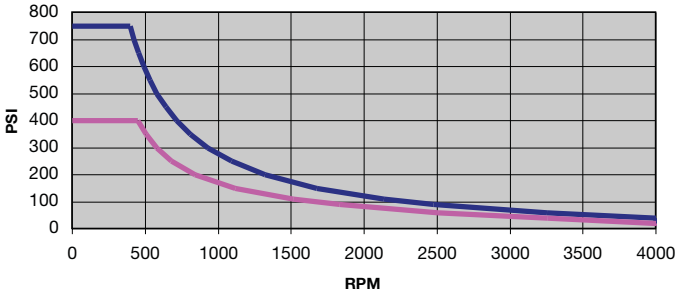

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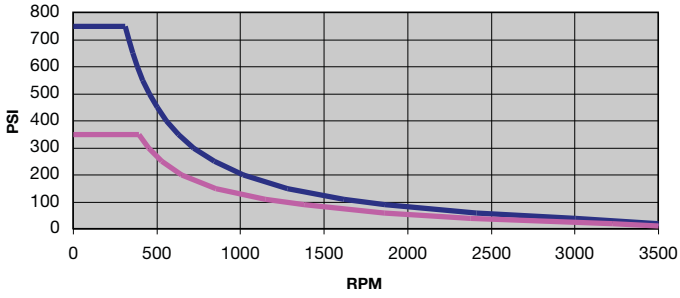
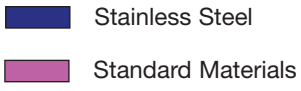




5000 SERIES

STAINLESS STEEL

GENERAL PURPOSE

Operating Parameters

MEDIA

Water, Steam, Hot Oil, Air

PRESSURE*

750 PSI (Water), **120 PSI** (Steam)
100 PSI (Hot Oil), **300 PSI** (Air)

TEMPERATURE*

300° F (Water), **350° F** (Steam), **395° F** (Hot Oil)

SPEED*

1,000 RPM (NPT), **3,600 RPM** (MT)

THREADS

- **1/4" to 2" NPT**
- **BSP, BSPP & Metric Threads Available**

MATERIAL

300 Grade Stainless Steel

CONFIGURATION OPTIONS

Mono Flow and Dual Flow Configurations Available

** See Performance Charts For Details*

Features & Benefits

Corrosion Resistant

300 Grade stainless steel construction for superior corrosion resistance.

Long Service Life

Two precision bearings keep the 5000 Series seal faces perfectly aligned to extend the life of the 5000 Series Rotary Union.

Dual Flow Option

With the addition of an elbow, the 5000 Series can become dual flow.

Balanced Mechanical Seal Design

The balanced mechanical seal design of the 5000 series allows for optimal operation with a wide variety of media.

Replaceable Cartridge

Integrated cartridge design makes repairs fast and easy reducing maintenance costs.

Multiple Seal Design Options

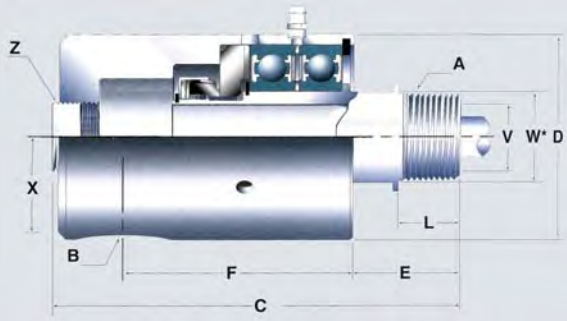
All sizes are available with three seal options for better wear resistance.

- **5000 Series Standard**
  Carbon graphite against a ceramic coated steel seal design offers long life.
- **5000 T Series** (Consult Factory)
  The carbon graphite seal ring against a tungsten carbide face ring design will offer longer wear life where dirty media is used.
- **5000 ASM Series** (Consult Factory)
  The tungsten carbide face ring against a siliconized graphite seal ring design is used for abrasive applications.

PART NUMBERS

5000 SERIES ROTARY UNIONS • NPT, UNS, UN THREADS • MONO FLOW

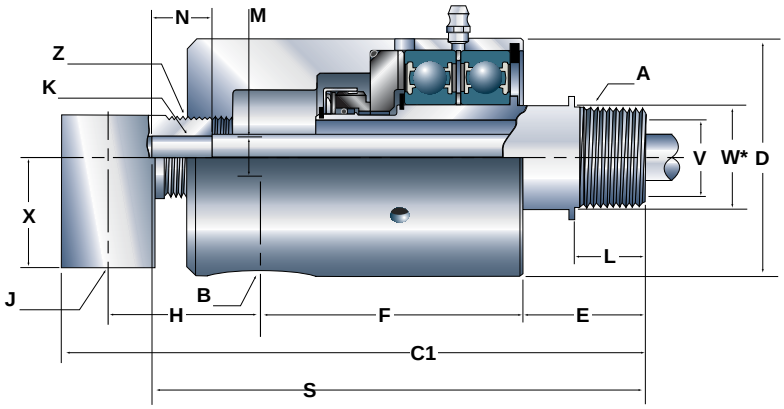
Nominal Pipe Size	Shaft Thread (A)	5000 Series Standard					
		Right Hand			Left Hand		
		Part Number	Description	Repair Cartridge	Part Number	Description	Repair Cartridge
1/4	1/4 NPT	**750625C**	R5000P	451671C	**750624C**	L5000P	451670C
3/8	3/8 NPT	**750110C**	R5100P	451251C	**750109C**	L5100P	451250C
	5/8-18 UNF	**750142C**	R5124P	451253C	**750141C**	L5124P	451252C
1/2	1/2 NPT	**750112C**	R5200P	451258C	**750111C**	L5200P	451257C
	3/4-16 UNF	**750147C**	R5224P	451260C	**750146C**	L5224P	451259C
	Quick Release	**750150C**	Q5200P	451263C	**750150C**	Q5200P	451263C
3/4	3/4 NPT	**750089C**	R5300P	451265C	**750088C**	L5300P	451264C
	1-14 UNS	**750152C**	R5324P	451267C	**750151C**	L5324P	451266C
	Quick Release	**750155C**	Q5300P	451270C	**750155C**	Q5300P	451270C
1	1 NPT	**750114C**	R5400P	451272C	**750113C**	L5400P	451271C
	1-1/2-12 UNF	**750157C**	R5424P	451274C	**750156C**	L5424P	451273C
	Quick Release	**750160C**	Q5400P	451277C	**750160C**	Q5400P	451277C
1-1/4	1-1/4 NPT	**750116C**	R5500P	451279C	**750115C**	L5500P	451278C
	1-3/4-12 UN	**750162C**	R5524P	451281C	**750161C**	L5524P	451280C
	Quick Release	**750165C**	Q5500P	451284C	**750165C**	Q5500P	451284C
1-1/2	1-1/2 NPT	**750118C**	R5600P	451286C	**750117C**	L5600P	451285C
	2-12 UN	**750167C**	R5624P	451288C	**750166C**	L5624P	451287C
	Quick Release	**750170C**	Q5600P	451291C	**750170C**	Q5600P	451291C
2	2 NPT	**750120C**	R5700P	451293C	**750119C**	L5700P	451292C
	2-1/2-12 UN	**750172C**	R5724P	451295C	**750171C**	L5724P	451294C
	Quick Release	**750175C**	Q5700P	451298C	**750175C**	Q5700P	451298C



DIMENSIONS

5000 SERIES ROTARY UNIONS • NPT, UNS, UN THREADS • MONO FLOW (in.)

Nominal Pipe Size	Shaft Thread A (Right or Left)	B (NPT)	C	C1	D	E	F	H	J (NPT)	L	V	W (Flats)	X	Z (NPT)
1/4	1/4 NPT	3/8	4	5-1/4	1-9/16	1-1/4	2-9/32	1-3/8	3/8	9/16	1/4	5/8	1-1/16	3/8
3/8	3/8 NPT	3/8	4	5-1/4	1-9/16	1-1/4	2-9/32	1-3/8	3/8	5/8	3/8	5/8	1-1/16	3/8
	5/8-18 UNF													
1/2	1/2 NPT	1/2	4-3/4	5-15/16	2-1/16	1-9/32	2-23/32	1-7/16	3/8	3/4	1/2	7/8	1-1/16	3/8
	3/4-16 UNF													
	Quick Release													
3/4	3/4 NPT	3/4	5-1/4	6-1/2	2-5/16	1-13/32	3	1-9/16	1/2	3/4	11/16	1-1/4	1-1/16	1/2
	1-14 UNS													
	Quick Release													
1	1 NPT	1	6-3/16	7-1/2	3-1/8	1-5/8	3-7/16	1-13/16	1/2	15/16	1	1-3/8	1-15/32	3/4
	1-1/2-12 UNF													
	Quick Release													
1-1/4	1-1/4 NPT	1-1/4	7-1/2	9-1/16	3-1/2	2-9/64	4-1/32	2-5/32	3/4	1-1/16	1-1/4	1-5/8	1-1/32	1
	1-3/4-12 UN MT													
	Quick Release													
1-1/2	1-1/2 NPT	1-1/2	8-3/8	9-15/16	4	2-13/32	4-17/32	2-1/4	3/4	1-1/16	1-1/2	1-15/16	1-5/32	1-1/4
	2-12 UN													
	Quick Release													
2	2 NPT	2	9-1/2	11	4-3/8	2-21/32	5-1/16	2-1/2	3/4	1-1/8	1-7/8	2-1/2	1-5/32	1-1/4
	2-1/2-12 UN													
	Quick Release													



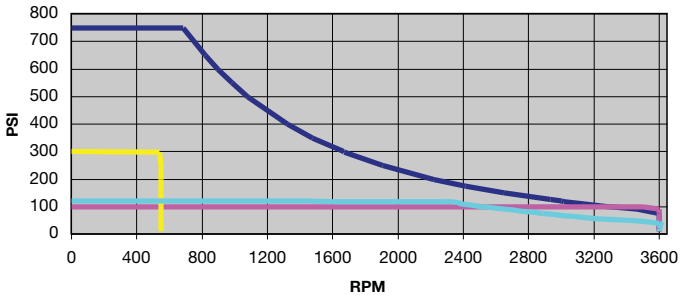
5000 SERIES ELBOWS FOR DUAL FLOW (in.)

ELBOWS FOR DUAL FLOW

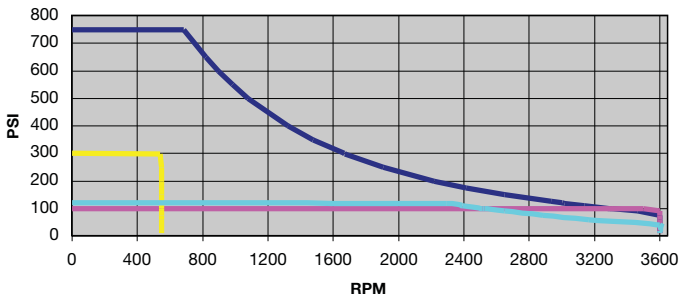
Nominal Pipe Size	Elbows for Stationary Siphon Systems				Elbows for Rotating Siphon Systems				
	Part Number	Siphon K Pipe Thread Tube OD	Siphon Pipe	Siphon Tube	Part Number	Siphon (K)	S	M	N
3/8	**465409C**	1/4	-	4-1/4	-	-	-	-	-
1/2	**465408C**	1/8 NPT	4-15/16	-	**451245C**	3/8	4-9/16	.370-.371	1-1/4
	465410C	3/8	-	4-15/16	-	-	-	-	-
BSP	**465416C**	1/8-28 BSP	125 mm	-	-	-	-	-	-
3/4	**465401C**	1/8 NPT	5-3/8	-	-	-	-	-	-
	465402C	1/4 NPT	5-15/32	-	-	-	-	-	-
	465403C	7/16	-	5-5/32	-	-	-	-	-
	465404C	1/2	-	5-5/32	**451243C**	1/2	5-5/32	.495-.496	1-1/4
BSP	**465417C**	1/8-28 BSP	136 mm	-	-	-	-	-	-
	465418C	1/4-19 BSP	139 mm	-	-	-	-	-	-
1	**465411C**	1/4 NPT	6-5/16	-	-	-	-	-	-
	465412C	3/8 NPT	6-3/16	-	**451246C**	5/8	6-1/8	.619-.612	1-1/4
	465413C	5/8	-	6-1/4	-	-	-	-	-
BSP	**465419C**	3/8-19 BSP	157 mm	-	-	-	-	-	-
1-1/4	**465414C**	1/2 NPT	7-13/32	-	-	-	-	-	-
	465415C	3/4	-	7-9/16	**451247C**	3/4	7-7/16	.743-.745	1-1/2
BSP	**465420C**	1/2-14 BSP	188 mm	-	-	-	-	-	-
1-1/2	**465405C**	1/2 NPT	8-9/32	-	-	-	-	-	-
	465406C	3/4 NPT	8-1/4	-	**451244C**	1	8-9/16	.998-1.000	1-3/4
	465407C	1	-	8-1/2	-	-	-	-	-
BSP	**465421C**	3/4-14 BSP	210 mm	-	-	-	-	-	-
2	**465405C**	1/2 NPT	9-11/32	-	-	-	-	-	-
	465406C	3/4 NPT	9-9/32	-	**451244C**	1	9-19/32	.998-1.000	1-3/4
	465407C	1	-	9-17/32	-	-	-	-	-
BSP	**465421C**	3/4-14 BSP	235 mm	-	-	-	-	-	-

Performance Charts

1/4"



3/8"



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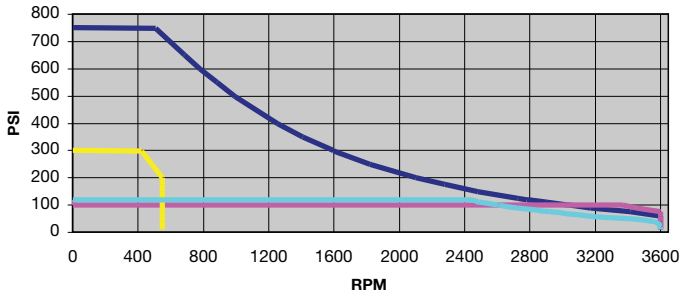

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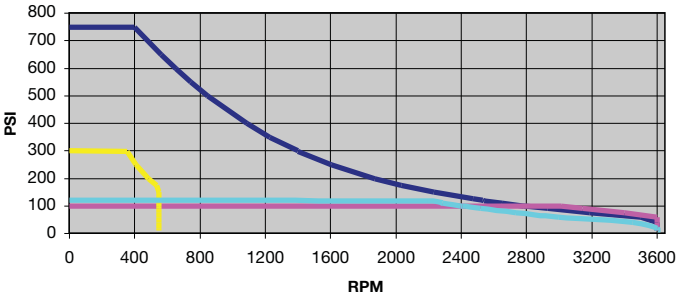

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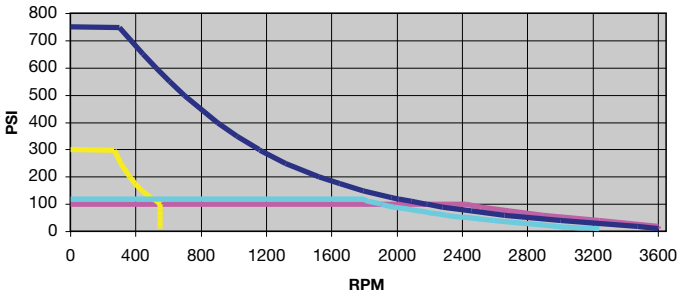

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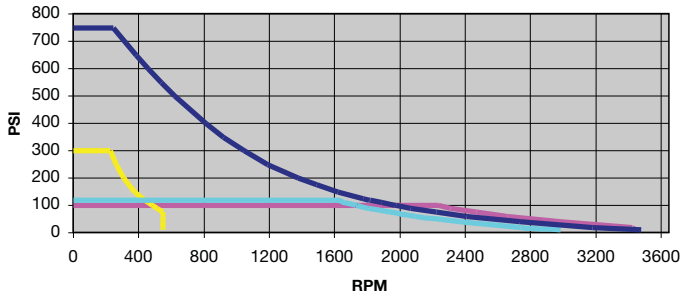

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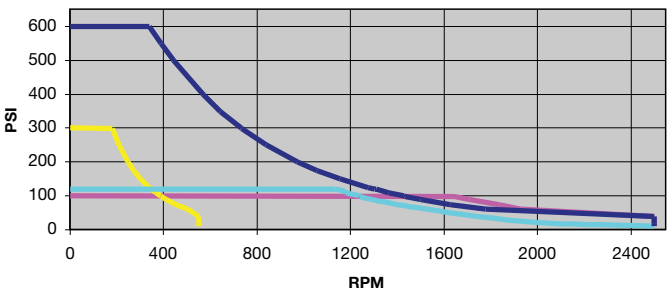

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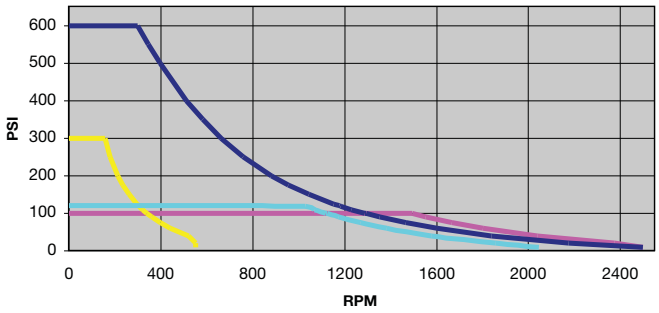


Steam Water Hot Oil Air

9000 SERIES

GENERAL PURPOSE

Operating Parameters

MEDIA

Water, Steam, Hot Oil

PRESSURE*

250 PSI

TEMPERATURE*

375° F (Water), 375° F (Steam), 375° F (Hot Oil)

SPEED*

700 RPM

THREADS

- 1/4" to 3" NPT
- BSP & ISO228 Flanged Available

MATERIAL

Cast Iron Housing, Steel Shaft, Stainless Steel Seal Face

CONFIGURATION OPTIONS

Mono Flow & Dual Flow Configurations Available

** See Performance Charts For Details*

Features & Benefits

Advanced Sealing System

The Bellows Sealing System provides superior sealing performance throughout the wear life of the Rotary Union.

Resists Debris Build-Up

Debris in contaminated media will not be captured in the Bellows Sealing System, which reduces clogging.

Superior Alignment

Dual bearings available in all sizes over 1 1/4" to provide superior alignment.

Flanged Mounted Units Available

Consult Factory.

9000 SERIES ROTARY UNIONS • MONO FLOW

PART NUMBERS

Nominal Pipe Size	Shaft Thread (A)	Right Hand Thread			Left Hand Thread		
		Part Number	Description	Repair Cartridge	Part Number	Description	Repair Cartridge
1/4	1/4 NPT	**730432C**	R030P	441647C	**730431C**	L030P	441646C
	9/16-18 MT	**730434C**	R024P	441649C	**730433C**	L024P	441648C
	5/8-18 MT	**730436C**	R024P	441651C	**730435C**	L024P	441650C
3/8	3/8 NPT	**730444C**	R100P	441659C	**730443C**	L100P	441658C
	5/8-18 MT	**730446C**	R124P	441661C	**730445C**	L124P	441660C
1/2	1/2 NPT	**730396C**	R200P	441630C	**730395C**	L200P	441629C
	3/4-16 MT	**730402C**	R224P	441634C	**730401C**	L224P	441633C
	7/8-14 MT	**730410C**	R224P	441636C	**730409C**	L224P	441635C
	3/4-14 MT	**730639C**	R224P	441632C	**730638C**	L224P	441631C
	7/8-16 MT	**730641C**	R224P	441709C	**730640C**	L224P	441708C
3/4	3/4 NPT	**730332C**	R300P	441597C	**730331C**	L300P	441596C
	1-14 MT	**730338C**	R324P	441599C	**730337C**	L324P	441598C
1	1 NPT	**730303C**	R400P	441579C	**730302C**	L400P	441578C
	1-1/4-12 MT	**730309C**	R424P	441581C	**730308C**	L424P	441580C
1-1/4	1-1/4 NPT	**440320C**	R9500P	471460C	**440319C**	L9500P	471459C
	1-5/8-8 MT	**440326C**	R9524P-3	471462C	**440325C**	L9524P-3	471461C
	1-5/8-12 MT	**440324C**	R9524P-2	471464C	**440323C**	L9524P-2	471463C
1-1/2	1-1/2 NPT	**440144C**	R9600P	471364C	**440143C**	L9600P	471363C
	2-8 MT	**440148C**	R9624P-3	471368C	**440147C**	L9624P-3	471367C
	2-12 MT	**440152C**	R9624P-2	471374C	**440151C**	L96240P-2	471373C
2	2 NPT	**440465C**	R97004P	471554C	**440464C**	L9700P	471553C
2-1/2	2-1/2 NPT	**440535C**	R9800P	471556C	**440534C**	L9800P	471555C
3	3 NPT	**440493C**	R9900P	471558C	**440492C**	L9900P	471557C
	3-1/2-8 MT	**440499C**	R9924P-3	471644C	**440498C**	L9924P-3	471643C

9000 SERIES ROTARY UNIONS • DUAL FLOW

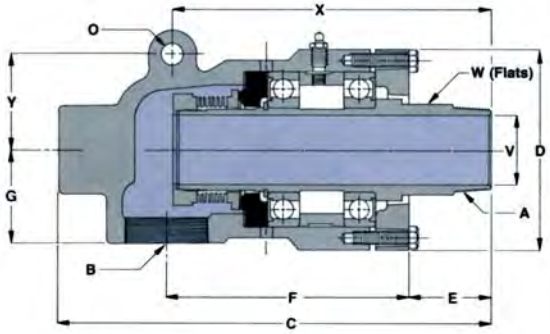
PART NUMBERS

Nominal Pipe Size	Shaft Thread (A)	Right Hand Thread			Left Hand Thread		
		Part Number	Description	Repair Cartridge	Part Number	Description	Repair Cartridge
1/2	1/2 NPT	**730398C**	R200S	441630C	**730397C**	L200S	441629C
	3/4-16 MT	**730404C**	R224S	441634C	**730403C**	L224S	441633C
	7/8-14 MT	**730412C**	R224S	441636C	**730411C**	L224S	441635C
3/4	3/4 NPT	**730334C**	R300S	441597C	**730333C**	L300S	441596C
	1-14 MT	**730340C**	R324S	441599C	**730339C**	L324S	441598C
1	1 NPT	**730305C**	R400S	441579C	**730304C**	L400S	441578C
	1-1/4-12 MT	**730311C**	R424S	441581C	**730310C**	L424S	441580C
1-1/4	1-1/4 NPT	**440322C**	R9500S	471460C	**440321C**	L9500S	471459C
	1-5/8-8 MT	**440330C**	R9524S-3	471462C	**440329C**	L9524S-3	471461C
	1-5/8-12 MT	**440328C**	R9524S-2	471464C	**440327C**	L9524S-2	471463C
1-1/2	1-1/2 NPT	**440146C**	R9600S	471364C	**440145C**	L9600S	471363C
	2-8 MT	**440150C**	R9624S-3	471368C	**440149C**	L9624S-3	471367C
	2-12 MT	**440154C**	R9624S-2	471374C	**440153C**	L96240S-2	471373C
2	2 NPT	**440467C**	R9700S	471554C	**440466C**	L9700S	471553C
2-1/2	2-1/2 NPT	**440575C**	R9800S	471556C	**440574C**	L9800S	471555C
3	3 NPT	**440495C**	R9900S	471558C	**440494C**	L9900S	471557C

9000 SERIES ROTARY UNIONS • DUAL FLOW ROTATING SIPHON

PART NUMBERS

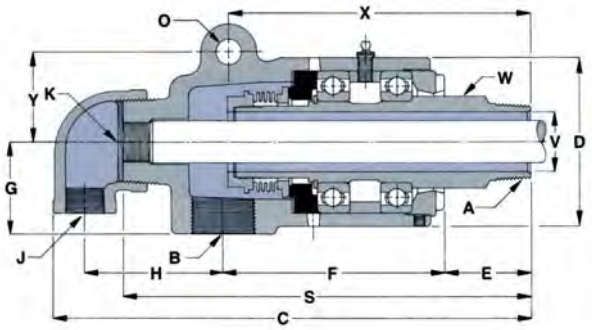
Nominal Pipe Size	Shaft Thread (A)	Right Hand Thread			Left Hand Thread		
		Part Number	Description	Repair Cartridge	Part Number	Description	Repair Cartridge
1/2	1/2 NPT	**730400C**	R225-4	441630C	**730399C**	L225-4	441629C
	3/4-14	**730406C**	XR225-4	441632C	**730405C**	XL225-4	441631C
	3/4-16	**730408C**	XR225-4	441634C	**730407C**	XL225-4	441633C
	7/8-14	**730414C**	XR225-4	441636C	**730413C**	XL225-4	441635C
	7/8-16	**730644C**	XR225-4	441709C	**730643C**	XL225-4	441708C
3/4	3/4-14	**730336C**	R325-2	441597C	**730335C**	L325-2	441596C
	1-14	**730342C**	XR325-2	441599C	**730341C**	XL325-2	441598C
1	1 NPT	**730307C**	R425-10	441579C	**730306C**	L425-10	441578C
	1-1/2-12	**730315C**	XR425-10	441583C	**730314C**	XL425-10	441582C
	1-1/4-12	**730313C**	XR425-10	441581C	**730312C**	XL425-10	441580C
1-1/4	1-1/4 NPT	**440334**	R9525-20	471460	**440333**	L9525-20	471459
	1-5/8-12 MT	**440336**	XR9525-20	471464	**440335**	XL9525-20	471463
1-1/2	1-1/2 NPT	**440251**	R9625-30	471364	**440250**	L9625-30	471363
	2-12 MT	**440438**	XR9625-30	471374	**440437**	XL9625-30	471373
	2-8 MT	**440449**	XR9625-30	471368	**440448**	XL9625-30	471367
2	2 NPT	**440475**	R9725-30	471554	**440474**	L9725-30	471553
2-1/2	2-1/2 NPT	**440585**	R9825-40	471556	**440584**	L9825-40	471555
3	3 NPT	**440587**	R9925-50	471558	**440586**	L9925-50	471557



9000 SERIES ROTARY UNIONS • MONO FLOW (in.)

DIMENSIONS

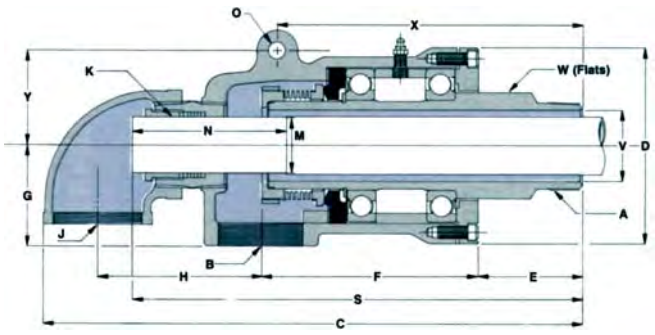
Nominal Pipe Size	Thread (A)	Inlet B (NPT)	C	D	E	F	G	V	W	O	Y	X
1/4	1/4 NPT 9/16-18 MT 5/8-18 MT	1/4	4-3/8	1-3/4	1-1/8	2-9/16	1-1/16	1/4	5/8	-	-	-
3/8	3/8 NPT 5/8-18 MT	3/8	4-3/8	1-3/4	1-1/8	2-9/16	1-1/16	3/8	11/16	-	-	-
1/2	1/2 NPT 3/4-16 MT 7/8-14 MT 3/4-14 MT 7/8-16 MT	1/2	5	2-3/8	1-1/2	2-3/4	1-1/4	1/2	15/16	-	-	-
3/4	3/4 NPT 1-14 MT	3/4	5-1/2	2-1/2	1-5/8	3	1-7/16	3/4	1-3/4	-	-	-
1	1 NPT 1-1/4-12 MT	1	6-1/8	3	1-3/4	3-3/8	1-3/4	1	1-11/32	-	-	-
1-1/4	1-1/4 NPT 1-5/8-8 MT 1-5/8-12 MT	1-1/4	9-1/16 8-15/16	3-3/4	2-1/16 1-15/16	4-13/16	2-3/16	1-1/4	1-11/16	5/8	2	6-7/8 6-3/4
1-1/2	1-1/2 NPT 2-8 MT 2-12 MT	1-1/2	9-11/16 10-1/4	4/18	2-3/16 2-3/4	5-1/4	2-3/16	1-1/2	1-15/16	5/8	2-1/4	7-3/4 7-15/16
2	2 NPT	2	11-3/4	5-7/8	2-7/16	6-7/8	2-5/8	2	2-9/16	5/8	2-3/4	8-9/16
2-1/2	2-1/2 NPT	2-1/2	13-7/8	6-1/2	3-1/2	7-3/16	3-3/8	2-1/2	3	-	-	-
3	3 NPT 3-1/2-8 MT	3	15-3/8 15-3/4	7-1/8	3-1/2 3-7/8	8-5/16	3-7/8	3	3-5/8	- -	- -	- -



9000 SERIES ROTARY UNIONS • DUAL FLOW • STATIONARY SIPHON (in.)

DIMENSIONS

Nominal Pipe Size	Shaft Thread (A)	Inlet (B)	Outlet (J)	Siphon K (NPSM)	C	D	E	F	G	H	S	V	W	O	Y	X
1/2	1/2 NPT 3/4-16 MT 7/8-14 MT	1/2	1/2	1/8	7-1/4	2-3/8	1-1/2	2-3/4	1-1/4	2-1/8	6	1/2	15/16	-	-	-
3/4	3/4 NPT 1-14 MT	3/4	1/2	1/4	7-3/4	2-1/2	1-5/8	3	1-7/16	2-3/8	6-3/8	3/4	1-1/8	-	-	-
1	1 NPT 1-1/4-12 MT	1	1/2	3/8	8-1/2	3	1-3/4	3-3/8	1-3/4	2-5/8	7-1/8	1	1-3/8	-	-	-
1-1/4	1-1/4 NPT 1-5/8-8 MT 1-5/8-12 MT	1-1/4	1/2	1/2"	10-5/8 10-7/8	3-3/4	2-1/8 2	4-13/16	2	-	8-7/8 8-3/4	1-1/4	1-11/16	5/8	2	6-3/4
1-1/2	1-1/2 NPT 2-8 MT 2-12 MT	1-1/2	3/4	3/4"	11-3/8 11-15/16	4-1/8	2-3/16 2-3/4	5-1/4	2-3/16	-	9-9/16 10-1/8	1-1/2	1-15/16	5/8	2-1/4	7-3/8 7-15/16
2	2 NPT	2	1	3/4"	13-7/8	5-7/8	2-7/16	6-1/2	2-5/8	-	11-1/2	2	2-9/16	5/8	2-3/4	8-9/16
2-1/2	2-1/2 NPT	2	1	1"	16-7/8	6-1/2	3-1/2	7-1/4	3-3/8	-	14	2-1/2	3	—	—	—
3	3 NPT	2-1/2	1-1/4	1-1/4"	18-3/4	7-1/8	3-1/2	8-5/16	3-7/8	-	15-5/8	3	3-5/8	—	—	—



DIMENSIONS

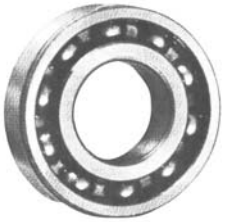
9000 SERIES ROTARY UNIONS • DUAL FLOW ROTATING SIPHON (in.)

Nominal Pipe Size	Shaft Thread (A)	Inlet (B)	Outlet (J)	Siphon (K)	C	D	E	F	G	H	M	N	O	S	V	W	X	Y
1/2"	1/2 NPT 3/4-14 MT 3/4-16 MT 7/8-14 MT 7/8-16 MT	1/2	1/2	1/4 Tube	7-1/4	2-3/8	1-1/2	2-3/4	1-1/4	2-1/8	0.249 to 0.252	1-5/8	-	6-1/4	1/2	15/16	-	-
3/4"	3/4 NPT 1-14 MT	3/4	1/2	1/4 Pipe	7-3/4	2-1/2	1-5/8	3	1-7/16	2-3/4	0.522 to 0.528	1-3/4	-	6-13/16	3/4	1-1/8	-	-
1"	1 NPT 1-1/4-12 MT	1	1/2	3/8 Pipe	8-1/2	3	1-3/4	3-3/8	1-3/4	2-5/8	0.657 to 0.663	2	-	7-11/16	1	1-3/8	-	-
1-1/4	1-1/4 NPT 1-5/8-12 MT	1-1/4	1/2	1/2 Pipe	10-5/8 10-1/2	3-3/4	2-1/8 2	4-13/16	2	3	0.803 to .808	3	5/8	9-7/16 9-5/16	1-1/4	1-11/16	6 -7/8 6-3/4	2
1-1/2	1-1/2 NPT 2-12 MT 2-8 MT	1-1/2	3/4	3/4 Pipe	11-3/8 11-15/16	4-1/8	2-3/16 2-3/4	5-1/4	2-3/16	3-1/4	0.991 to 0.997	3-1/4	5/8	10-1/8 10-3/4	1-1/2	1-15/16	7-3/8 7-15/16	2-1/4
2	2 NPT	2	1	3/4 Pipe	13-7/8	5-7/8	2-7/16	6-1/2	2-5/8	4-1/16	0.991 to 0.997	3-1/4	5/8	12-1/8	2	2-9/16	8-9/16	2-3/4
2-1/2	2-1/2 NPT	2	1-1/4	1 Pipe	16-7/8	6-1/2	3-1/2	7-1/4	3-3/8	5	1.241 to 1.247	3-3/4	-	14-11/16	2-1/2	3	-	-
3	3 NPT	2-1/2	1-1/4	1-1/4 Pipe	18-3/4	7-1/8	3-1/2	8-5/16	3-7/8	5-1/2	1.615 to 1.621	4-1/4	-	16-3/8	3	3-5/8	-	-

* Flanged models available. Consult Factory.

9000 Series Repair Parts

Shaft



Ball Bearing

Bearing Retainer

Seal Ring

Bellows Assembly

Bellows Gasket

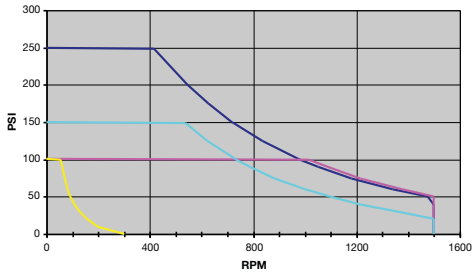
REPAIR PARTS

9000 SERIES ROTARY UNIONS • REPAIR PARTS

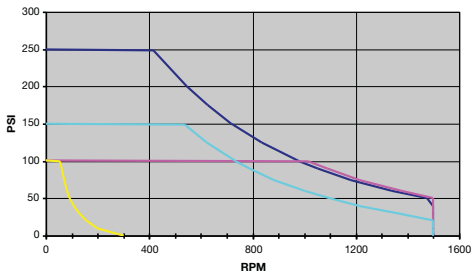
Nominal Pipe Size	Thread Rotation	Shaft		Ball Bearing	Bearing Retainer	Seal Ring	Bellows Gasket	Bellows Assembly	Housing Gasket
		Shaft Thread (A)	Part Number						
1/4	LH	1/4 NPT	**463474C**	482020C	847022C	463472C	482033C	481010C	482026C
	RH		**463475C**						
	LH	9/16-18 MT	**463476C**						
	RH		**463477C**						
	LH	5/8-18 MT	**463478C**						
	RH		**463479C**						
3/8	LH	3/8 NPT	**463484C**	482020C	847022C	463472C	482033C	481010C	482026C
	RH		**463485C**						
	LH	5/8-18 MT	**463486C**						
	RH		**463487C**						
1/2	LH	1/2 NPT	**463428C**	482076C	854744C	463426C	482090C	481018C	482083C
	RH		**463429C**						
	LH	3/4-16 MT	**463436C**						
	RH		**463437C**						
	LH	7/8-14 MT	**463430C**						
	RH		**463431C**						
	LH	3/4-14 MT	**463434C**						
	RH		**463435C**						
	LH	7/8-16 MT	**463432C**						
	RH		**463433C**						
3/4	LH	3/4 NPT	**463291C**	482134C	844654C	463287C	482148C	481035C	482141C
	RH		**463292C**						
	LH	1-14 MT	**463293C**						
	RH		**463294C**						
1	LH	1 NPT	**463265C**	482188C	844341C	463264C	482201C	481048C	482195C
	RH		**463266C**						
	LH	1-1/4-12 MT	**463277C**						
	RH		**463278C**						
1-1/4	LH	1-1/4 NPT	**485070C**	482241C	854753C	482246C	482255C	481062C	482248C
	RH		**485071C**						
	LH	1-5/8-8 MT	**485086C**						
	RH		**485087C**						
	LH	1-5/8-12 MT	**485084C**						
	RH		**485085C**						
1-1/2	LH	1-1/2 NPT	**483951C**	482303C	863095C	482308C	482316C	481073C	482310C
	RH		**483952C**						
	LH	2-8 MT	**483953C**						
	RH		**483954C**						
	LH	2-12 MT	**483955C**						
	RH		**483956C**						
2	LH	2 NPT	**485181C**	482362C	854757C	482786C	482788C	481247C	482787C
	RH		**485182C**						
2-1/2	LH	2-1/2 NPT	**485256C**	482809C	854762C	482811C	482813C	481268C	482812C
	RH		**485257C**						
3	LH	3 NPT	**485155C**	482839C	854766C	482841C	482843C	481289C	482842C
	RH		**485156C**						
	LH	3-1/2-8 MT	**485199C**						
	RH		**485200C**						
	LH	3-1/2-12 MT	**485189C**						
	RH		**485198C**						

Performance Charts

1/4"



3/8"



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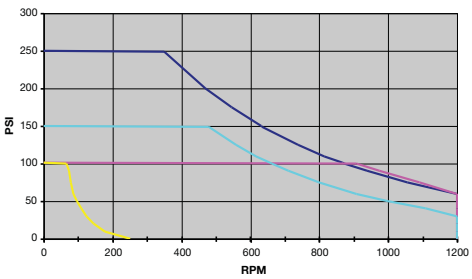
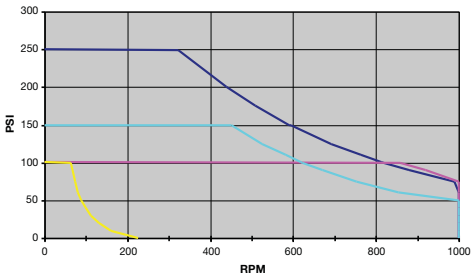


3/4"



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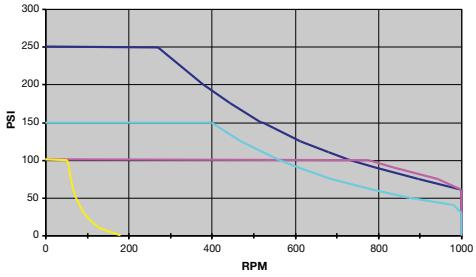
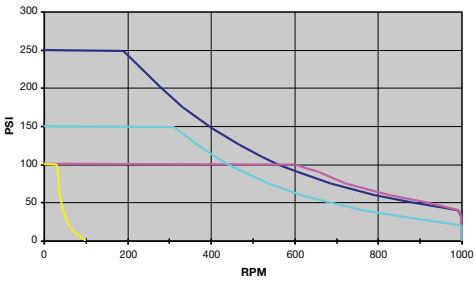


1 1/4"



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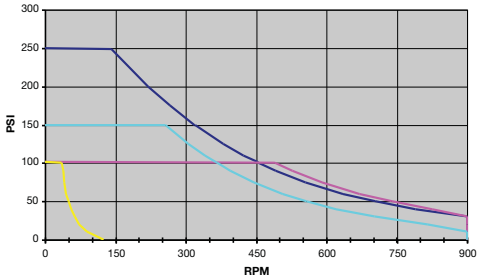

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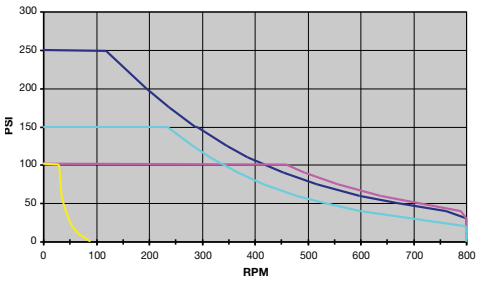

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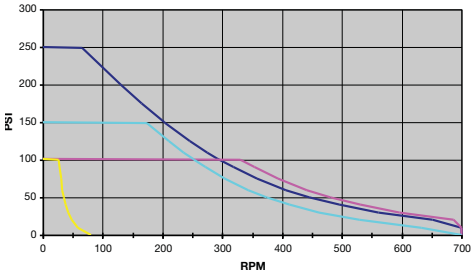

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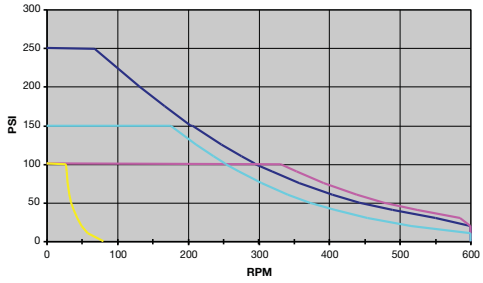

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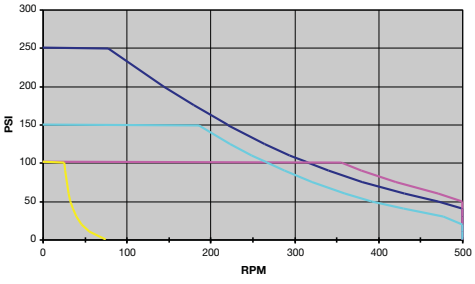

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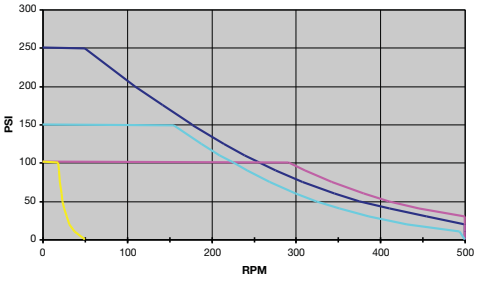
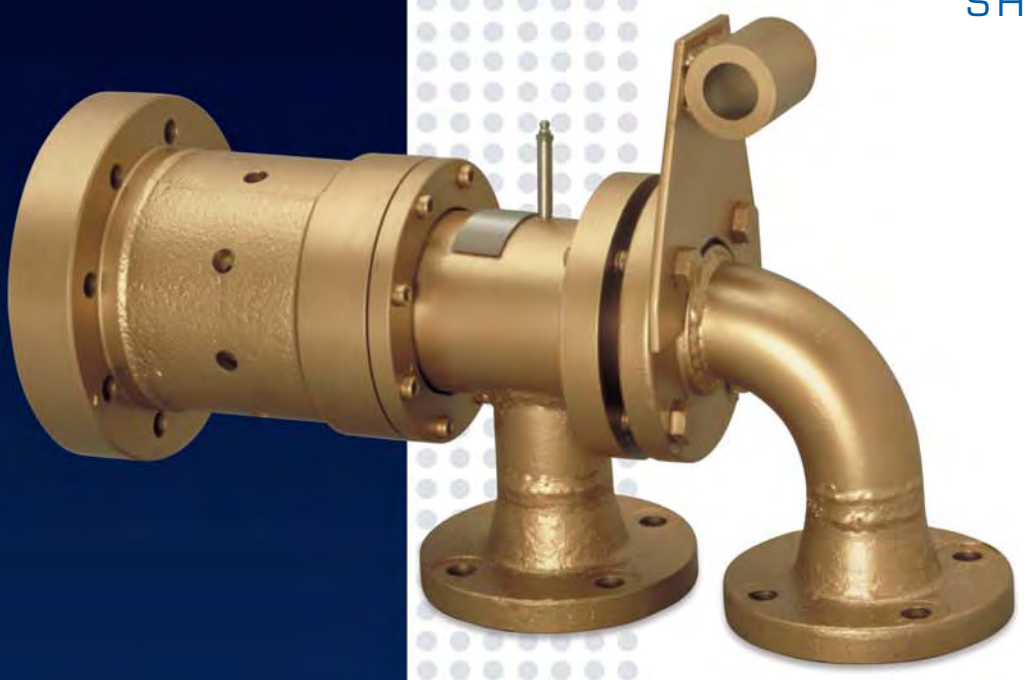


Steam Water Hot Oil Air

2000 SERIES

WATER, HOT OIL & AIR

SHOCK & VIBRATION RESISTANT



Operating Parameters

MEDIA
Water, Hot Oil, Air

PRESSURE*
150 PSI (Water), **100 PSI** (Air & Hot Oil)

TEMPERATURE*
375° F (Water), **550° F** (Hot Oil)**

SPEED*
500 RPM

CONNECTIONS
2" to 4" ASA Flange

MATERIAL
Cast Iron Housing, Steel Shaft

CONFIGURATION OPTIONS
Mono Flow & Dual Flow Configurations Available

** See Performance Charts For Details*

***** Consult factory for applications exceeding 375° F***

Features & Benefits

Heavy Duty Design

Designed with two ball bearings spaced to withstand radial and thrust loads.

No Leakage In Tough Applications

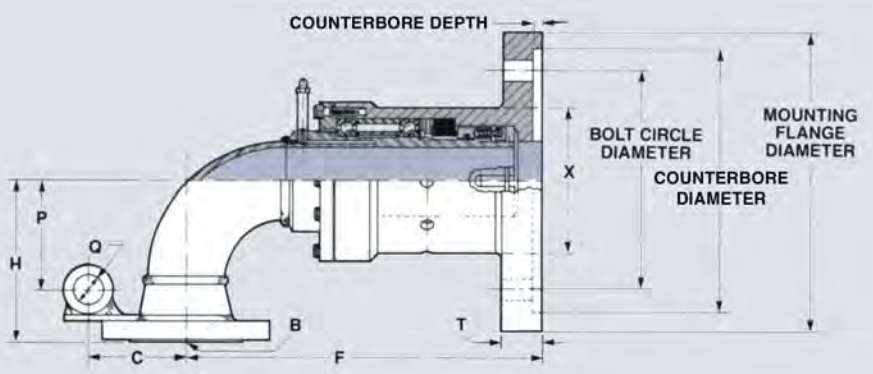
Compression springs in the 2000 Series provide even loading across the seal surfaces to maintain zero leakage even in low pressure applications.

Easy Maintenance

Designed with an integral flange that allows repairs without removing the housing from the machine.

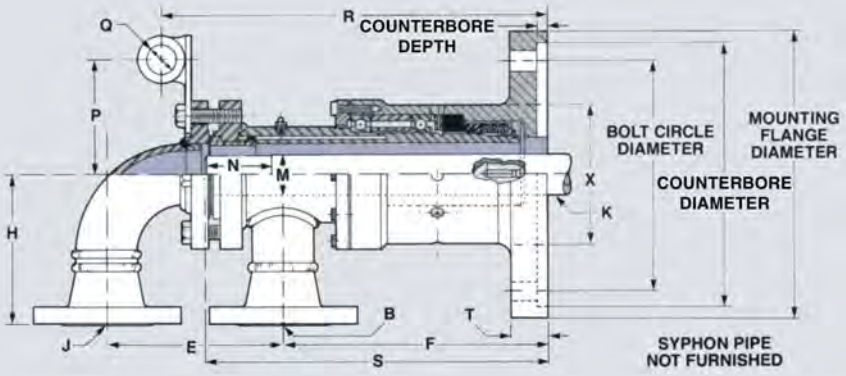
Easy Mounting

The flange attaches directly to the machine journal, providing inherently concentric mounting, minimizing overhang, and partially relieving bearing load to increase service life.



2000 SERIES ROTARY UNIONS • MONO FLOW (in.)

Nominal Pipe Size	Part Number	Repair Cartridge	B (3)	F	T	Mounting Flange Diameter	Bolt Circle Diameter	Flange Type	Counterbore		Bolt Hole Size	Number of Bolt Holes (4)	H	P	Diameter (X)	Diameter (Q)	C
									Diameter	Depth							
2	**730747C**	441781C	2	12-3/4	1-7/16	10	7-1/8	2	9.002 to 9.004	3/16	11/16	4	5-1/2	N/A	5-1/4	-	-
3	**730841C**	441845C	3	16-1/8	1-3/4	9-1/2	7-9/16	2				8	7-1/4	N/A	6-5/16	-	-
4	**730842C**	441846C	4	20-1/4	1-3/4	11-1/2	8-15/16	2	10.824 to 10.820		13/16	6	9-1/8	6-3/4	7-3/4	1/8	5-3/4



2000 SERIES ROTARY UNIONS • DUAL FLOW • WITH REVOLVING SYPHON (in.)

Nominal Pipe Size	Part Number	Repair Cartridge	B(3)	F	T	Mounting Flange Diameter	Bolt Circle Diameter	Flange Type	Counterbore		Bolt Hole Size	Number of Bolt Holes	H	P	Diameter (X)	Diameter (Q)	K(1)	M(2)	N	J(3)	S	E	R
									Diameter	Depth													
2	**730843C**	441847C	1-1/2	10	1-7/16	10	7-1/8	2	9.002 to 9.004	3/16	11/16	4	4-5/8	-	-	-	3/4	.991 to .997	4-1/4	1-1/2	13-3/8	6-5/8	N/A
3	**730737C**	441786C	2-1/2	12-1/2	1-3/4	9-1/2	7-9/16		9.002 to 9.004		11/16	8	7-1/8	5-1/2	6-1/4	1-3/8	1-1/2	1.865 to 1.871		2-1/2	16-1/4	8-3/8	18-1/4
4	**730852C**	441860C	2-1/2	15-3/8	1-3/4	11-1/2	8-15/16		10.820 to 10.824		13/16	6	7-1/8	6-1/8	7-3/4	1-3/8	2-1/2	2.801 to 2.807		2-1/2	19-3/8	8-7/8	21

(1) Standard syphon pipe diameter.

(2) Machined dimension to allow revolving syphon pipe to run concentrically with journal diameter to within .005" T.I.R.

(3) 150 lb. ASA Flange.

(4) Equally spaced.

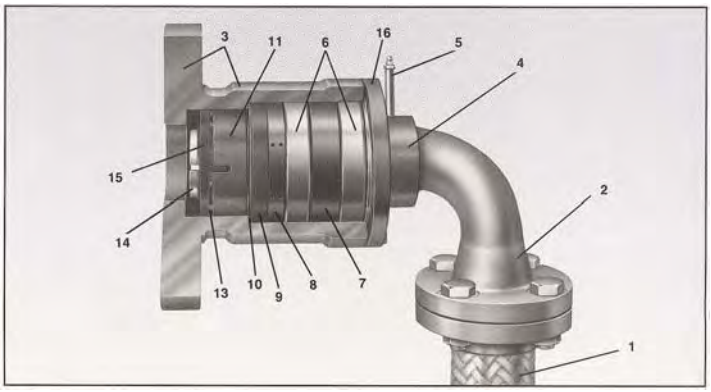
(5) Not applicable to this size joint.

Notes:

1. For heat transfer oil applications, consult factory

2. Other flange dimensions available. See previous page.

3. For dimensions on 5"- 6", consult factory



The unique design of this 2000 series flanged type rotary joint permits them to be used to introduce heating or cooling agents into rolls or cylinders in various types of machinery. Models are available to handle water, oil and other fluids in applications requiring sealing pressure to 150 psi, speeds to 500 rpm, and temperatures to 550°F, when specified.

1 **FLEXIBLE HOSE** eliminates complex piping, allows adjustment of rolls without repiping. Allows rotary joint to "float" so as to avoid unnecessary strain on sealing surfaces. A flexible hose either rubber or metal — must always be used with rotary joints.

2 **FLANGED INLET** elbow of steel is a 150 lb. ASA flange type.

3 **FLANGED ROTATING HOUSING** prevents leakage under pressure and protects the internal parts for a long service life. The flanged housing attaches directly to the machine journal, providing inherently concentric mounting, minimizes overhang. The housing may rotate in either direction without causing back out problems.

4 **STATIONARY SHAFT** is constructed of steel. It serves as a conduit for the fluid transfer from the flanged inlet into the revolving flanged housing.

5 **LUBRICATION FITTING** located on the stationary shaft allows lubrication of the ball bearings while the rotary joint is in operation.

6 **TWO SINGLE ROW, WIDELY SPACED BALL BEARINGS** for radial and thrust loads.

7 **GREASE RING ASSEMBLY** of steel, ground and spaced for ball bearing load sharing for increased life.

8 **DRAIN RING** is made of steel. It allows minute start-up leakage from entering the ball bearings.

9 **SEAL RING** forms the primary rotating seal with the face ring. The seal ring is constructed of carbon graphite to provide a low friction, wear resistant surface.

10 **GASKET** provides an effective seal between the housing and the fluid chamber.

11 **THE FACE RING** constructed of hardened and tempered stainless steel mates with the seal ring to form the primary seal.

12 **O-RING ELASTOMER (not shown)** of ethylene propylene for hot water applications. For higher temperature applications, a perfluoroelastomer is used.

13 **COMPRESSION SPRINGS** apply an initial pressure between the face ring and seal ring to provide sealing for low pressure applications.

14 **DRIVE COLLAR** keys the face ring and the shaft together to prevent rotation.

15 **RETAINER RINGS** secure the internal components to the shaft.

16 **FLANGE SECURES** the internal components within the flanged housing. This allows quick rotary joint repair and less machine downtime.

2000 & 9000 SERIES • BOLT & FLANGE DIMENSIONS

Shaft I.D.	Minimum Bolt Circle		Maximum Flange Diameter (A)	Maximum Flange Thickness
	Bolt Circle (B)	Cap Screw Diameter		
2	7-1/8	5/8	10-7/8	1-7/16
3	7-9/16	5/8	13-1/2	1-3/4
4	8-15/16	3/4	14-7/8	2-1/16
5	11-9/16	1	16-1/4	2-3/4

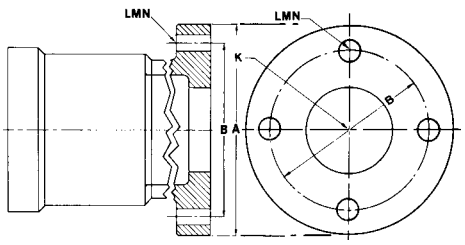
*All dimensions in inches

Order Checklist

Supply the following information when ordering

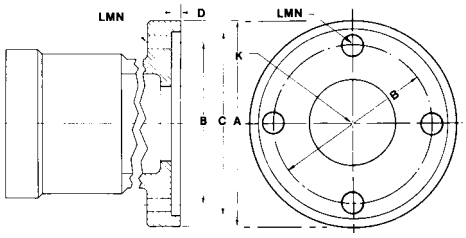
1. Desired bolt circle
2. Bolt hole size
3. Number of bolt holes and spacing
4. Desired flange thickness
5. Flange O.D.
6. Pilot diameter and type
7. Pilot (length or depth)

2000 Series Shock Resistant Flange Mountings



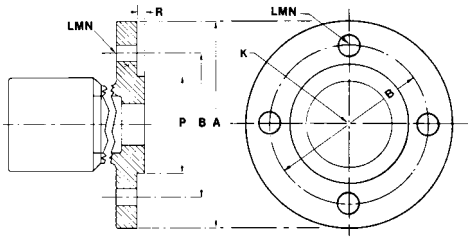
Flanged Housing
Type 1

- **A.** Overall diameter
- **B.** Bolt circle diameter
- **K.** Rotary Union joint shaft thread size and direction
- **L.** Size of bolt holes
- **M.** Type and size of bolts
- **N.** Number of bolt holes required



Flanged Housing w/ Counterbore
Type 2

- **A.** Overall diameter
- **B.** Bolt circle diameter
- **C.** O.D. of journal for sizing counterbore diameter
- **D.** Counterbore depth
- **K.** Rotary Union joint shaft thread size and direction
- **L.** Size of bolt holes
- **M.** Type and size of bolts
- **N.** Number of bolt holes required

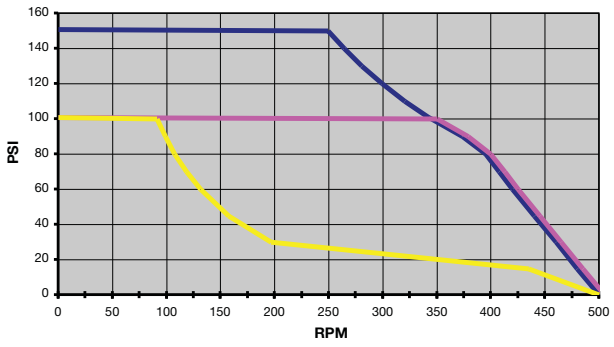


Flanged Housing w/ Pilot
Type 3

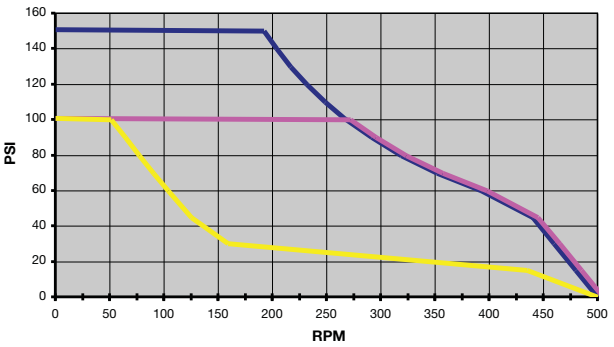
- **A.** Overall diameter
- **B.** Bolt circle diameter
- **K.** Rotary Union joint shaft thread size and direction
- **L.** Size of bolt holes
- **M.** Type and size of bolts
- **N.** Number of bolt holes required
- **P.** I.D. of jounal for sizing pilot diameter
- **R.** Pilot length

Performance Charts

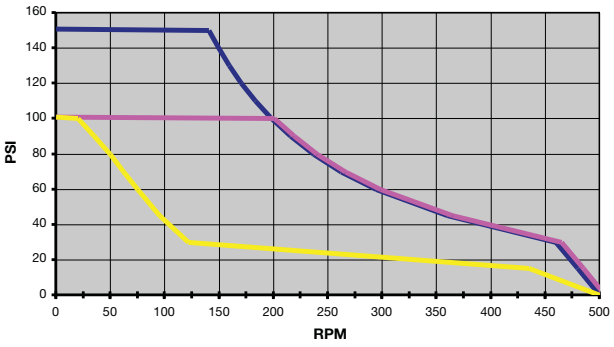
2"



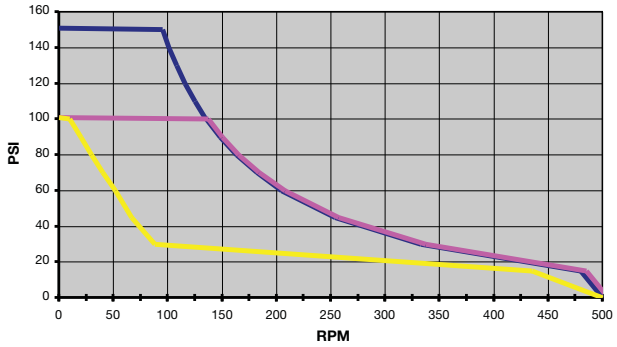
3"



4"



5"



Water Oil Air

8000 SERIES

STEAM & HOT OIL

Operating Parameters

MEDIA

Steam, Hot Oil

PRESSURE*

175 PSI (Steam), **100 PSI** (Hot Oil)

TEMPERATURE*

450° F (Steam), **600° F** (Hot Oil)

SPEED*

600 RPM

THREADS

- 1/2" to 4" NPT
- BSP or ISO228 Available
- Quick Release

MATERIAL

- Cast Iron Housing with Stainless Steel Sleeve
- Steel Shaft with Hardened Nickel Plating

CONFIGURATION OPTIONS

Mono Flow & Dual Flow Configurations Available

** See Performance Charts For Details*

Features & Benefits

Ideal For Steam Applications

Designed for operation in a variety of steam applications.

Safety

An anti-torque lug prevents rotation of the housing while in operation.

No Lubrication Needed

The special carbon graphite bearing is lubricated by the process fluid and requires no additional lubrication.

Hot Oil Applications

8000HO offers the same design features as the standard 8000 Series but with a special high temperature seal ring for hot oil applications.

Stainless Steel Insert

The stainless steel housing insert in the 8000T Series makes this joint a favorite in the textile industry

8000 SERIES ROTARY UNIONS • MONO FLOW

PART NUMBERS

Nominal Pipe Size (A)	Inlet (B)	Left Hand Thread				Right Hand Thread				Quick Release			
		Standard Spring	Description	Heavy Duty Spring	Description	Standard Spring	Description	Heavy Duty Spring	Description	Standard Spring	Description	Heavy Duty Spring	Description
1/2	1/2	430483C	L8200P	730215C	L8200P-HD	430484C	R8200P	730216C	R8200P-HD	430533C	Q8200P	730214C	Q8200P-HD
3/4	3/4	430485C	L8300P	730223C	L8300P-HD	430486C	R8300P	730224C	R8300P-HD	730534C	Q8300P	730225C	Q8300P-HD
1	1	730856C	L8400-T	-	-	730857C	R8400-T	-	-	430535C	Q8400P	730232C	Q8400P-HD
1-1/4	1-1/4	430489C	L8500P	730244C	L8500P-HD	430490C	R8500P	730245C	R8500P-HD	430536C	Q8500P	730246C	Q8500P-HD
1-1/2	1-1/2	730496C	L8600P	730506C	L8600P-HD	730497C	R8600P	730507C	R8600P-HD	730498C	Q8600P	730508C	Q8600P-HD
2	2	460617C	L8700P	730269C	L8700P-HD	460618C	R8700P	730270C	R8700P-HD	460616C	Q8700P	730271C	Q8700P-HD
2-1/2	2	430495C	L8800P	730278C	L8800P-HD	430496C	R8800P	730279C	R8800P-HD	430539C	Q8800P	730280C	Q8800P-HD
3	2-1/2	430497C	L8900P	730290C	L8900P-HD	430498C	R8900P	730291C	R8900P-HD	430540C	Q8900P	730292C	Q8900-HD
4	4	430501C	L81100P	730322C	L81100P-HD	430502C	R81100P	730323C	R81100P-HD	430542C	Q81100P	730324C	Q81100P-HD

8000 SERIES ROTARY UNIONS • DUAL FLOW

PART NUMBERS

Nominal Pipe Size (A)	Inlet (B)	Right Hand Thread				Left Hand Thread				Quick Release			
		Standard Spring	Description	Heavy Duty Spring	Description	Standard Spring	Description	Heavy Duty Spring	Description	Standard Spring	Description	Heavy Duty Spring	Description
1/2	1/2	430504C	R8200S	730219C	R8200S-HD	430503C	L8200S	730218C	L8200S-HD	430543C	Q8200S	730217C	Q8200S-HD
3/4	3/4	430506C	R8300S	730227C	R8300S-HD	430505C	L8300S	730226C	L8300S-HD	430544C	Q8300S	730228C	Q8300S-HD
1	1	730859C	R8400S-T	-	-	730858C	L8400S-T	-	-	430545C	Q8400S	730238C	Q8400S-HD
		730861C	XR8400S-T	-	-	730860C	XL8400S-T	-	-	430546C	XQ8400S	730235C	XQ8400S-HD
1-1/4	1-1/4	430512C	R8500S	730248C	R8500S-HD	430511C	L8500S	730247C	L8500S-HD	430547C	Q8500S	730249C	Q8500S-HD
1-1/2	1-1/2	730500C	R8600S	730523C	R8600S-HD	730499C	L8600S	730522C	L8600S-HD	730501C	Q8600S	730524C	Q8600S-HD
2	2	460648C	R8700S	730273C	R8700S-HD	460647C	L8700S	730272C	L8700S-HD	460595C	Q8700S	730274C	Q8700S-HD
2-1/2	2	430520C	R8800S	730285C	R8800S-HD	430517C	L8800S	730284C	L8800S-HD	430550C	Q8800S	730286C	Q8800S-HD
		430521C	R8800S	730282C	R8800S-HD	430518C	L8800S	730281C	L8800S-HD	430551C	Q8800S	730283C	Q8800S-HD
		430522C	R8800S	730288C	R8800S-HD	430519C	L8800S	730287C	L8800S-HD	430552C	Q8800S	730289C	Q8800S-HD
3	2-1/2	430526C	R8900S	730296C	R8900S-HD	430523C	L8900S	730293C	L8900S-HD	430553C	Q8900S	730299C	Q8900S-HD
		430527C	R8900S	730297C	R8900S-HD	430524C	L8900S	730294C	L8900S-HD	430554C	Q8900S	730300C	Q8900S-HD
		430528C	R8900S	730298C	R8900S-HD	430525C	L8900S	730295C	L8900S-HD	430555C	Q8900S	730301C	Q8900S-HD
4	4	431532C	R81100S	730326C	R81100S-HD	430531C	L81100S	730325C	L81100S-HD	430557C	Q81100S	730327C	Q81100S-HD

8000HO SERIES ROTARY UNIONS • MONO FLOW • HOT OIL

PART NUMBERS

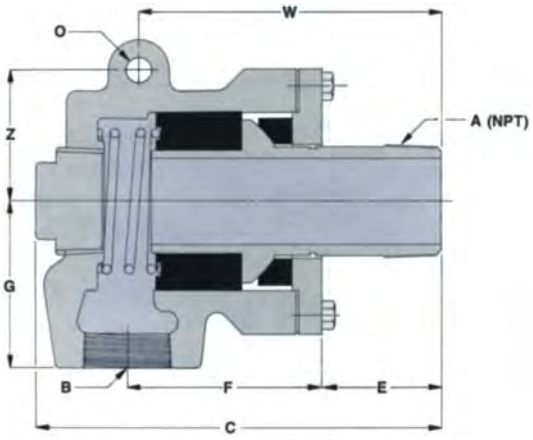
Nominal Pipe Size (A)	Right Hand Thread		Left Hand Thread		Quick Release	
	Part Number	Description	Part Number	Description	Part Number	Description
1/2	740226C	R8200P-HO	740225C	L8200P-HO	740227C	Q8200P-HO
3/4	740211C	R8300P-HO	740210C	L8300P-HO	740212C	Q8300P-HO
1	740242C	R8400P-HO	740241C	L8400P-HO	740243C	Q8400P-HO
1-1/4	740349C	R8500P-HO	740348C	L8500P-HO	740350C	Q8500P-HO
1-1/2	740279C	R8600P-HO	740278C	L8600P-HO	740280C	Q8600P-HO
2	740275C	R8700P-HO	740274C	L8700P-HO	740276C	Q8700P-HO
2-1/2	740425C	R8800P-HO	750026C	L8800P-HO	780995C	Q8800P-HO
3	740190C	R8900P-HO	740189C	L8900P-HO	740459C	Q8900P-HO

8000HO SERIES ROTARY UNIONS • DUAL FLOW • HOT OIL

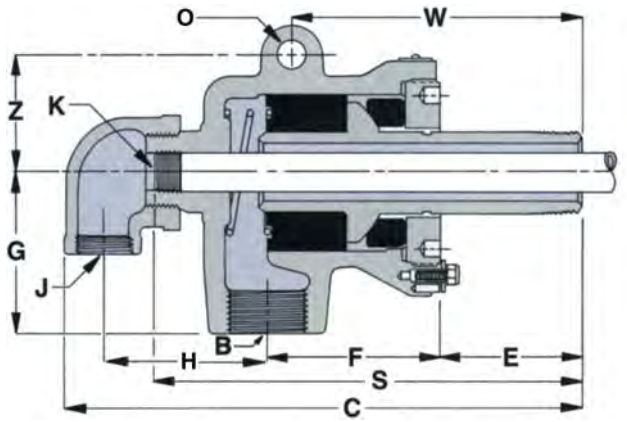
PART NUMBERS

Nominal Pipe Size (A)	Right Hand Thread		Left Hand Thread		Quick Release	
	Part Number	Description	Part Number	Description	Part Number	Description
1/2	740222C	R8200S-HO	740221C	L8200S-HO	-	Q8200S-HO
3/4	740324C	R8300S-HO	740323C	L8300S-HO	740325C	Q8300S-HO
1	740321C	R8400S-HO	740320C	L8400S-HO	740322C	Q8400S-HO
1-1/4	740388C	R8500S-HO	740387C	L8500S-HO	740389C	Q8500S-HO
1-1/2	740282C	R8600S-HO	740281C	L8600S-HO	740283C	Q8600S-HO
2	740272C	R8700S-HO	740271C	L8700S-HO	740273C	Q8700S-HO
2-1/2	740314C	R8800S-HO	740313C	L8800S-HO	740315C	Q8800S-HO
	740267C	R8800S-HO	740266C	L8800S-HO	740268C	Q8800S-HO
3	740286C	R8900S-HO	740285C	L8900S-HO	740287C	Q8900S-HO

Mono Flow



Dual Flow



8000 SERIES ROTARY UNIONS • STEAM & HOT OIL • MONO FLOW (in.)

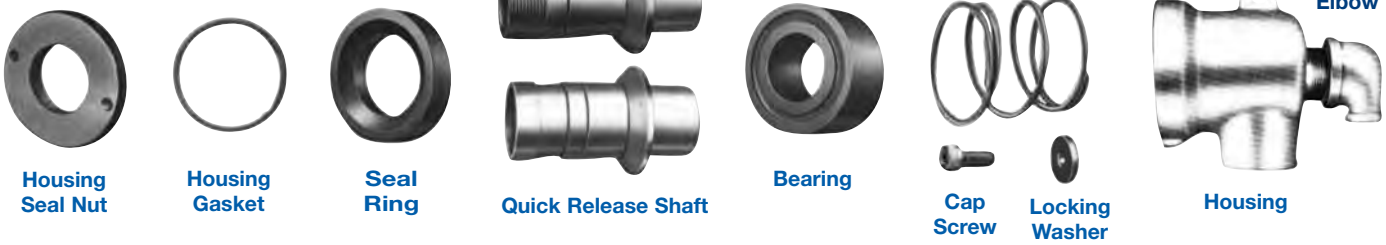
DIMENSIONS

Nominal Pipe Size (A)	Inlet B (NPT)	F	E	G	Overall Length (C)	W	Z	O
1/2	1/2 Quick Release	2-1/2	2-1/8	2	6-1/4	4-7/16	1-5/8	15/32
3/4	3/4 Quick Release	2-1/2	2-3/16	2-3/8	6-3/8	4-11/16	1-13/16	15/32
1	1 Quick Release	2-3/4	2-5/16	2-5/8	7-1/8	4-7/8	1-7/8	15/32
1-1/4	1-1/4 Quick Release	3-3/16	2-1/2	3	8-1/8	5-5/8	2-1/8	5/8
1-1/2	1-1/2 Quick Release	3-3/4	2-1/2	3-1/2	8-13/16	6	2-7/8	5/8
2	2 Quick Release	4	2-9/16	4	9-1/2	6-9/16	3-1/8	5/8
2-1/2	2 Quick Release	5-3/16	3-3/16	4-7/16	10-7/8	8	3-9/16	11/16
3	2-1/2 Quick Release	5-3/4	3-5/8	4-9/16	12-3/16	8-1/2	3-31/32	7/8
4	4 Quick Release	8-1/8	5-7/16	6-5/16	16-7/8	13-1/2	5-1/8	1-3/32

8000 SERIES ROTARY UNIONS • STEAM & HOT OIL • DUAL FLOW (in.)

DIMENSIONS

Nominal Pipe Size (A)	Inlet B (NPT)	Outlet J (NPT)	Siphon Tap K (NPSM)	C	F	E	G	S	W	Z	O	H
1/2	1/2	1/2	1/8	7-1/2	2-1/2	2-1/8	2	6-1/16	4-7/16	1-5/8	15/32	2-1/4
3/4	3/4	1/2	1/4	7-11/16	2-1/2	2-3/16	2-3/8	6-1/4	4-11/16	1-13/16	15/32	2-5/16
1	1	1/2	3/8	8-3/4	2-3/4	2-5/16	2-5/8	6-15/16	4-7/8	1-7/8	15/32	2-5/8
		1/2	1/4									
1-1/4	1-1/4	1/2	1/2	9-1/4	3-3/16	2-1/2	3	7-7/8	5-5/8	2-1/8	5/8	3-1/8
1-1/2	1-1/2	3/4	3/4	10-3/8	3-3/4	2-1/2	3-1/2	8-5/8	6	2-7/8	5/8	3-9/16
2	2	1	3/4	11-11/16	4	2-9/16	4	9-1/2	6-9/16	3-1/8	5/8	4
2-1/2	2	1-1/4	3/4	14-1/8	5-3/16	3-3/16	4-7/16	11-1/4	8	3-9/16	11/16	5-1/16
			1									
			1-1/4									
3	2-1/2	1-1/4	1	17	5-3/4	3-5/8	4-9/16	12-1/2	8-1/2	3-31/32	7/8	5-9/16
		1-1/4	1-1/4									
		1-1/2	1-1/2									
4	4	2-1/2	2	24-1/4	8-1/8	5-7/16	6-5/16	18-1/8	13-1/2	5-1/8	1-3/32	7-3/4



REPAIR PARTS

8000 SERIES ROTARY UNIONS • 1/2" to 1 1/4" REPAIR PARTS • STEAM ONLY

Nominal Pipe Size	Mono Flow Housing	Dual Flow Housing	Rotating Siphon Housing Part Number	LH Shaft (NPT)	RH Shaft (NPT)	Quick Release Shaft	Graphite Bearing	8000 Series Spring	8000 Series Hot Oil Heavy Duty Spring
1/2	487240C	487242C	Contact factory	471050C	471051C	471818C	484247C	484246C	487912C
3/4	487248C	487252C	Contact factory	481759C	481760C	471894C	484005C	484039C	487909C
1	487153C	487148C	441147C	441878C	441879C	471094C	484007C	484026C	487872C
1-1/4	487214C	487217C	Contact factory	481753C	481754C	471095C	484009C	484033C	487911C

Nominal Pipe Size	Graphite Seal Ring	Housing Gasket	Housing Seal Nut	Lock Washer	Socket Head Cap Screw	Rotating Siphon Models Only		
						Outlet Elbow	Siphon Packing Nut	Siphon Packing Ring Set
1/2	484245C	484361C	487239C	484037C	854295C	487234C	482039C*	482745C*
3/4	484004C	484038C	487304C	484037C	854295C	487235C	482038C	481473C
1	484006C	484025C	487159C	484023C	854295C	487160C	482040C	481475C
1-1/4	484008C	484032C	487213C	484031C	854295C	487212C	482041C	471476C

REPAIR PARTS

8000 SERIES ROTARY UNIONS • 1 1/2" to 4" REPAIR PARTS • STEAM ONLY

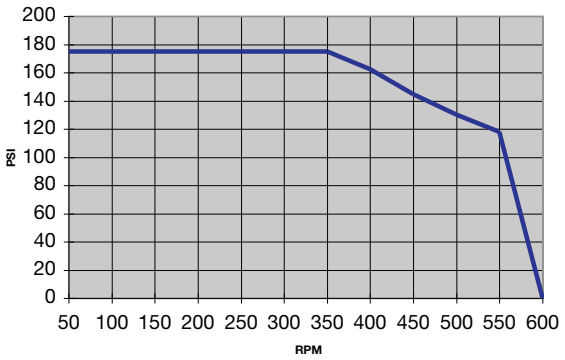
Nominal Pipe Size	Mono Flow Housing	Dual Flow Housing	Rotating Siphon Housing Part Number	LH Shaft (NPT)	RH Shaft (NPT)	Quick Release Shaft	Graphite Bearing	8000 Series Spring	8000 Series Hot Oil Heavy Duty Spring
1-1/2	Contact Factory	Contact Factory	N/A	481756C	481757C	471096C	484011C	484034C	487910C
2	Contact Factory	Contact Factory		471055C	471056C	471097C	484301C	484300C	487903C
2-1/2	Contact Factory	Contact Factory		471777C	471776C	471775C	485416C	485415C	463306C
3	Contact Factory	Contact Factory		471796C	471795C	471797C	485467C	485466C	487305C
4	Contact Factory	Contact Factory		471838C	471837C	471836C	485594C	485595C	463025C

Nominal Pipe Size	Graphite Seal Ring	Housing Gasket	Housing Flange	Housing Cap Screw	Housing Plug for Mono Flow Models	Outlet Elbow for Dual Flow Mondels Only	Siphon Packing Nut for RSP Models	Siphon Packing Ring for RSP Models
1-1/2	484010C	463514C	463513C	855366C	N/A	487171C	482042C	481477C
2	484249C	487927C	487926C	855236C	N/A	487155C	482042C	481477C
2-1/2	485420C	485421C	487208C	485545C	Contact Factory	487209C	N/A	N/A
3	485470C	485471C	487236C	485545C	Contact Factory	487303C	N/A	N/A
4	485596C	485593C	487238C	485605C	Contact Factory	487329C	N/A	N/A

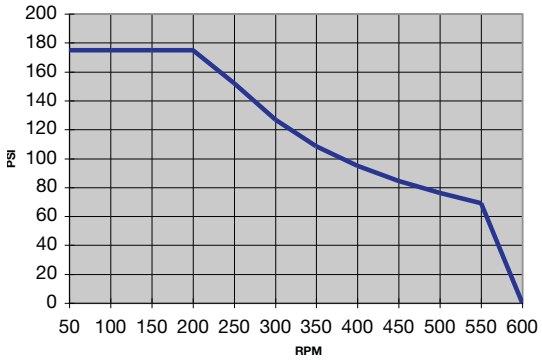
Performance Charts

8000 Series (with saturated steam)

1/2"



3/4" & 1"



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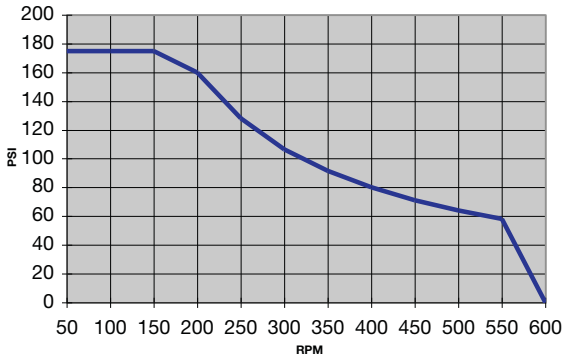

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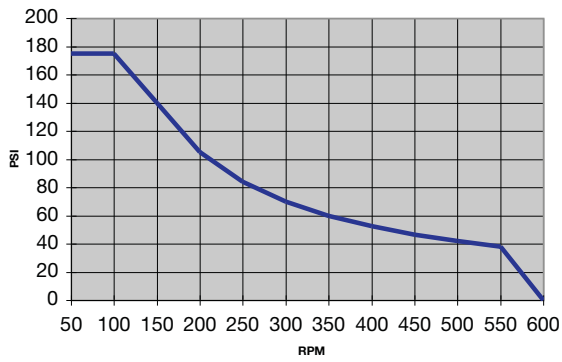

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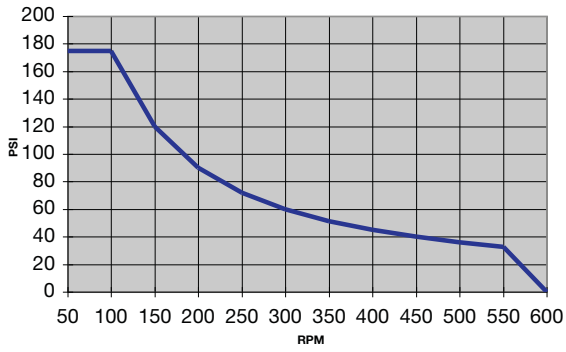

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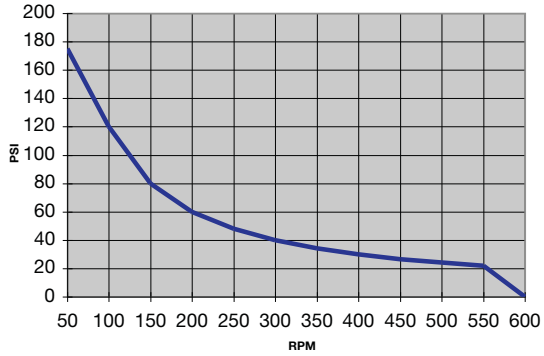

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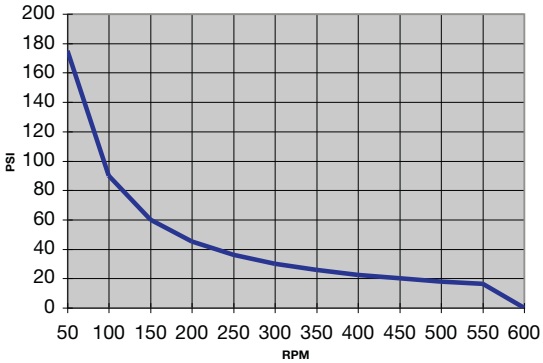

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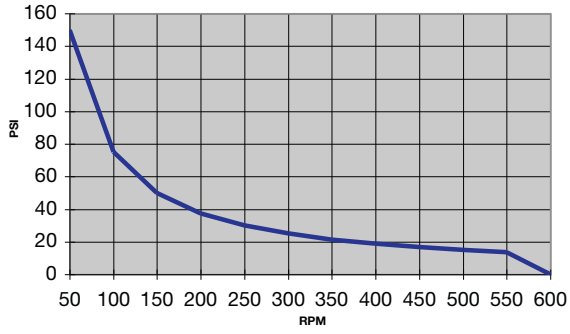
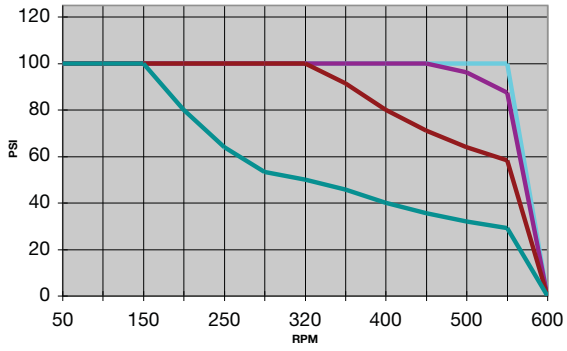


Performance Charts

8000HO Series (Hot Oil)

1/2"



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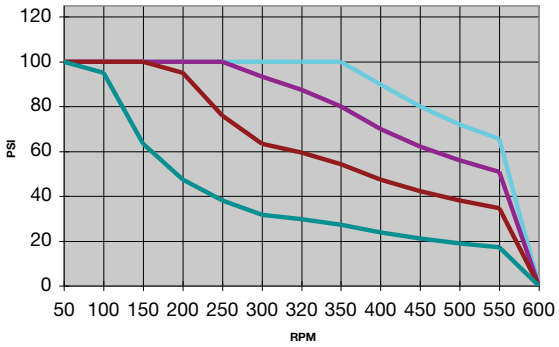

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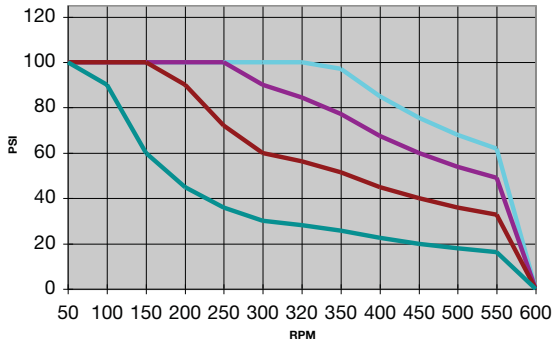

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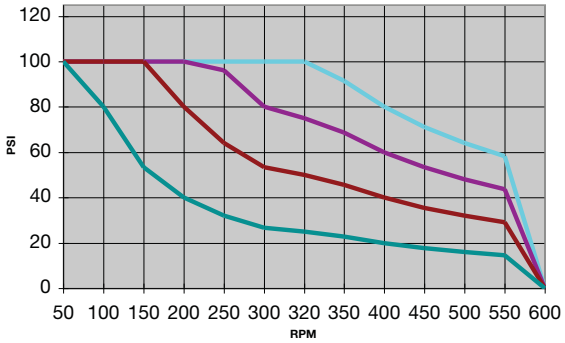

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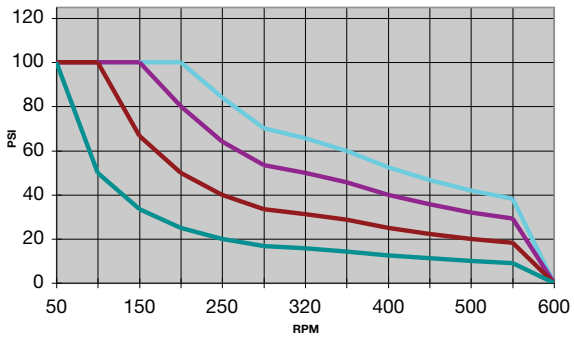

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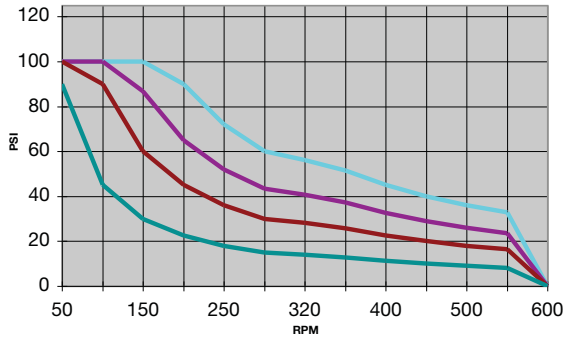

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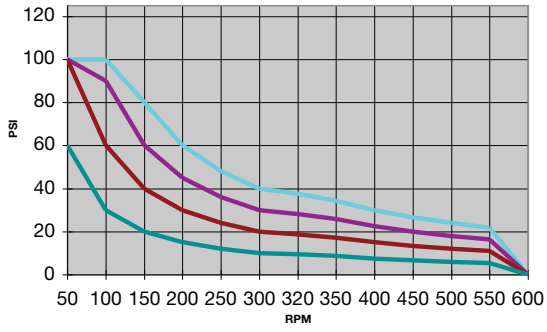

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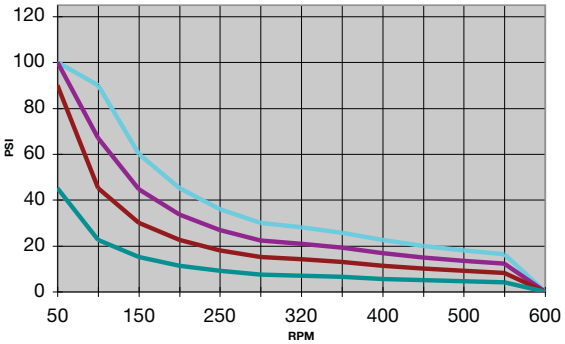


600° 550° 500° 450°

9000G SERIES

WATER, STEAM & HOT OIL

HIGH TEMPERATURE

Operating Parameters

MEDIA

Steam, Hot Oil, Water

PRESSURE*

250 PSI (Water), **175 PSI** (Steam), **100 PSI** (Hot Oil)

TEMPERATURE*

600° F (Hot Oil), **378° F** (Steam)

SPEED*

700 RPM

THREADS

- 1/4" to 3" NPT
- BSP Threads Available
- Flanged

MATERIAL

- Cast Iron Housing with Stainless Steel or Plated Sleeve
- Steel Shaft

CONFIGURATION OPTIONS

Mono Flow & Dual Flow Configurations Available

** See Performance Charts For Details*

Features & Benefits

Superior Sealing Performance

Bellows Sealing System provides superior sealing performance throughout the wear life of the Rotary Union.

Designed For Dirty Media Applications

Debris in contaminated media will not be captured in the Bellows Sealing System, which reduces clogging.

Maintenance Free

The 9000G is maintenance free because there is no rolling element bearing, therefore no lubrication is required.

High Temperature Applications

Offers the same design as the standard 9000 Series, but utilizes carbon graphite bearings for high temperature applications.

Ideal For High Temperatures

The thrust collar allows for thermal expansion, making this an ideal union for high temperature, general purpose applications.

Flanged Mounted Units Available

Consult Factory.

9000G SERIES HIGH TEMPERATURE ROTARY UNIONS • MONO FLOW

PART NUMBERS

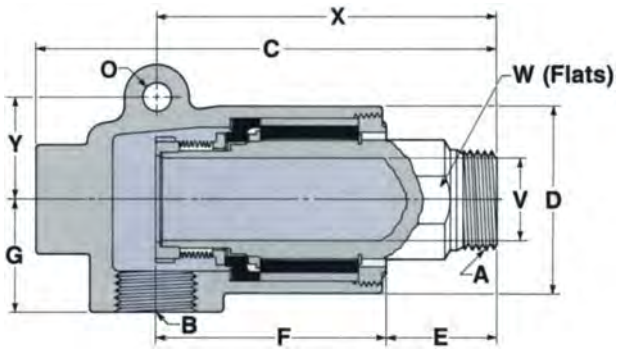
Nominal Pipe Size	Shaft Thread (A)	Right Hand Thread			Left Hand Thread		
		Part Number	Description	Repair Cartridge	Part Number	Description	Repair Cartridge
1/4	1/4	**480630C**	R050P	481323C	**480629C**	L050P	481322C
3/8	3/8	**480632C**	R150P	481325C	**480631C**	L150P	481324C
1/2	1/2	**480198C**	R250P	481204C	**480197C**	L250P	481203C
3/4	3/4	**480247C**	R350P	481208C	**480246C**	L350P	481207C
1	1	**430111C**	R450P-8	471882C	**430110C**	L450P-8	471881C
1-1/4	1-1/4	**440581C**	R9550P	471665C	**440580C**	L9550P	471664C
1-1/2	1-1/2	**440165C**	R9650P	471575C	**440164C**	L9650P	471576C
2	2	**440469C**	R9750P	471716C	**440468C**	L9750P	471715C
2-1/2	2-1/2	**440577C**	R9850P	471718C	**440576C**	L9850P	471717C
3	3	**440505C**	R9950P	471720C	**440504C**	L9950P	471719C

9000G SERIES HIGH TEMPERATURE ROTARY UNIONS • DUAL FLOW

PART NUMBERS

Nominal Pipe Size	Shaft Thread (A)	Right Hand Thread			Left Hand Thread		
		Part Number	Description	Repair Cartridge	Part Number	Description	Repair Cartridge
1/2	1/2	**480204C**	R250S	481204C	**480203C**	L250S	481203C
3/4	3/4	**480253C**	R350S	481208C	**480252C**	L350S	481207C
1	1	**430113C**	R450S-8	471882C	**430112C**	L450S-8	471881C
1-1/4	1-1/4	**440583C**	R9550S	471665C	**440582C**	L9550S	471664C
1-1/2	1-1/2	**440167C**	R9650S	471575C	**440166C**	L9650S	471576C
2	2	**440471C**	R9750S	471716C	**440470C**	L9750S	471715C
2-1/2	2-1/2	**440579C**	R9850S	471718C	**440578C**	L9850S	471717C
3	3	**440507C**	R9950S	471720C	**440506C**	L9950S	471719C

Mono Flow

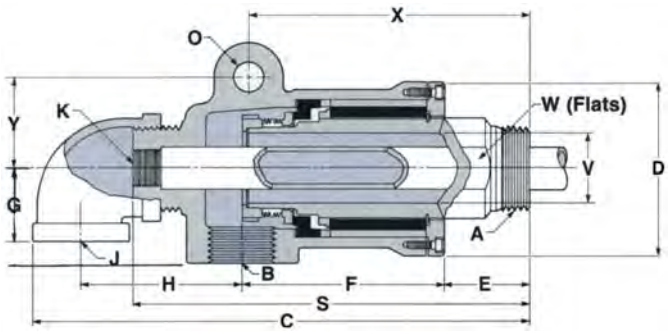


9000G SERIES HIGH TEMPERATURE ROTARY UNIONS • MONO FLOW (in.)

DIMENSIONS

Nominal Pipe Size	Shaft Thread (A)	Right Hand Thread			Left Hand Thread			Inlet Thread (B)	C	D	E	F	G	O	V	W	X	Y
		Part Number	Description	Repair Cartridge	Part Number	Description	Repair Cartridge											
1/4	1/4	**480630C**	R050P	481323C	**480629C**	L050P	481322C	1/4	4-3/8	1-3/4	1-1/8	2-9/16	1-1/16	—	1/4	5/8	—	—
3/8	3/8	**480632C**	R150P	481325C	**480631C**	L150P	481324C	3/8	4-3/8	1-3/4	1-1/8	2-9/16	1-1/16	—	3/8	11/16	—	—
1/2	1/2	**480198C**	R250P	481204C	**480197C**	L250P	481203C	1/2	5	2-3/8	1-1/2	2-3/4	1-1/4	—	1/2	15/16	—	—
3/4	3/4	**480247C**	R350P	481208C	**480246C**	L350P	481207C	3/4	5-1/2	2-1/2	1-5/8	3	1-7/16	—	3/4	1-3/32	—	—
1	1	**430111C**	R450P-8	471882C	**430110C**	L450P-8	471881C	1	6-1/8	3	1-3/4	3-3/8	1-3/4	—	1	1-11/32	—	—
1-1/4	1-1/4	**440581C**	R9550P	471665C	**440580C**	L9550P	471664C	1-1/4	9-1/16	3-3/4	2-1/16	4-13/16	2-3/16	5/8	1-1/4	1-11/16	6-7/8	2
1-1/2	1-1/2	**440165C**	R9650P	471575C	**440164C**	L9650P	471576C	1-1/2	9-11/16	4-1/8	2-3/16	5-1/4	2-3/16	5/8	1-1/2	1-15/16	7-3/8	2-1/4
2	2	**440469C**	R9750P	471716C	**440468C**	L9750P	471715C	2	11-3/4	5-7/8	2-7/16	6-7/16	2-5/8	5/8	2	2-9/16	8-9/16	2-3/4
2-1/2	2-1/2	**440577C**	R9850P	471718C	**440576C**	L9850P	471717C	2-1/2	15-3/8	7-1/8	3-1/2	7-3/16	3-3/8	—	2-1/2	3	—	—
3	3	**440505C**	R9950P	471720C	**440504C**	L9950P	471719C	3	15-3/4	7-1/8	3-7/8	8-5/16	3-7/8	—	3	3-5/8	—	—

Dual Flow



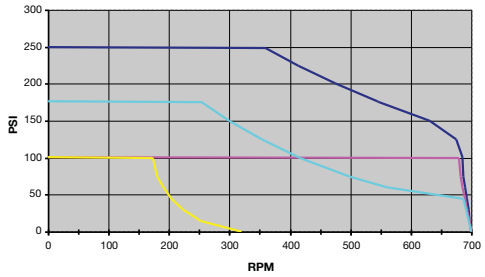
9000G SERIES HIGH TEMPERATURE ROTARY UNIONS • DUAL FLOW (in.)

DIMENSIONS

Nominal Pipe Size	Shaft Thread (A)	Inlet (B)	Outlet (J)	Siphon K (NPSM)	C	D	E	F	G	H	O	S	V	W	X	Y
1/2	1/2	1/2	1/2	1/8	7-1/4	2-3/8	1-1/2	2-3/4	1-1/4	2-1/8	—	6	1/2	15/16	—	—
3/4	3/4	3/4	1/2	1/4	7-3/4	2-1/2	1-5/8	3	1-7/16	2-3/8	—	6-3/8	3/4	1-3/32	—	—
1	1	1	1/2	3/8	8-1/2	3	1-3/4	3-3/8	1-3/4	2-5/8	—	7-1/8	1	1-11/32	—	—
1-1/4	1-1/4	1-1/4	1/2	1/2	10-5/8	3-3/4	2-1/8	4-13/16	2	3	5/8	8-7/8	1-1/4	1-11/16	6-7/8	2
1-1/2	1-1/2	1-1/2	3/4	3/4	11-3/8	4-1/8	2-3/16	5-1/4	2-3/16	3-1/4	5/8	9-9/16	1-1/2	1-15/16	7-3/8	2-1/4
2	2	2	1	3/4	13-7/8	5	2-7/16	6-1/2	2-5/8	4-1/16	5/8	11-1/2	2	2-9/16	8-9/16	2-3/4
2-1/2	2-1/2	2	1-1/4	1	16-7/8	6-1/2	3-1/2	7-1/4	3-3/8	5	—	14	2-1/2	3	—	—
3	3	2-1/2	1-1/4	1-1/4	18-3/4	7-1/8	3-1/2	8-5/16	3-7/8	5-1/2	—	15-5/8	3	3-5/8	—	—

Performance Charts

1/4"



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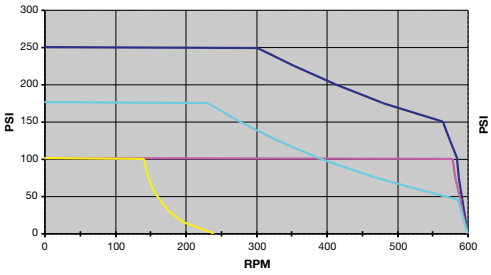
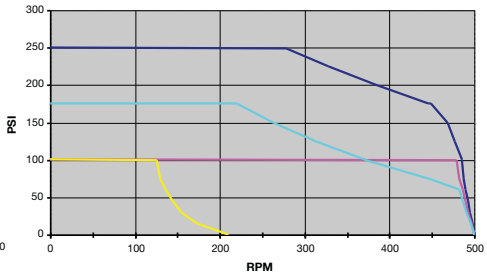


3/4"



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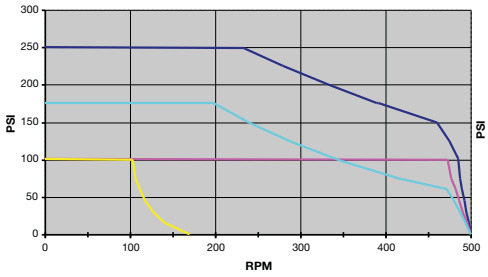
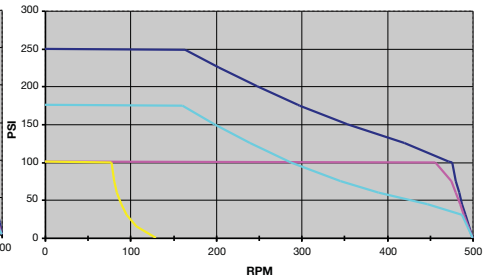


1 1/4"



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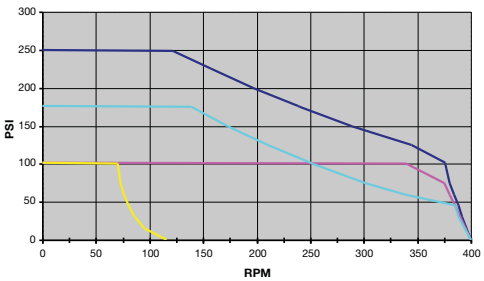

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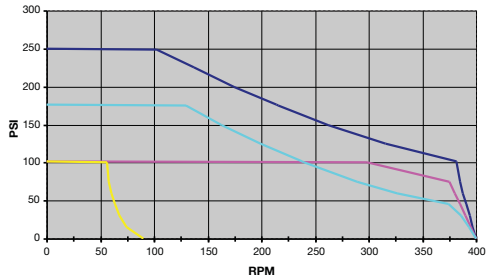

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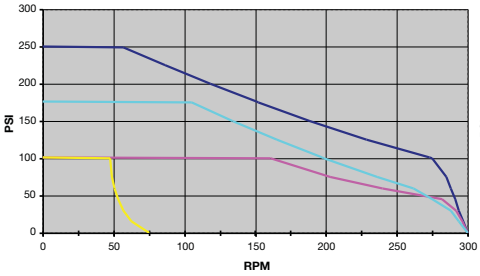

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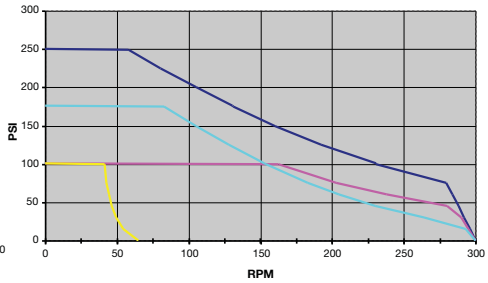

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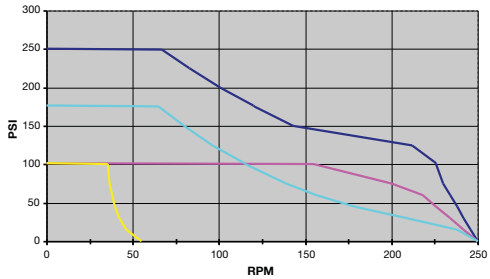

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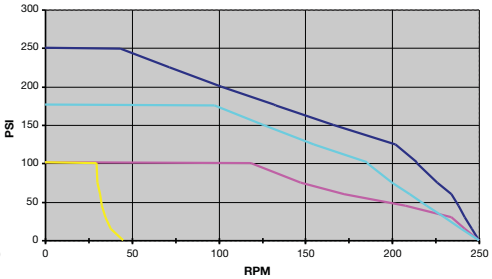


HPMC • HSMC SERIES

MULTI-PORT ROTARY UNIONS

Operating Parameters

MEDIA
Water, Air, Hydraulic Fluid

PRESSURE*
170 PSI (HSMC), **5,880 PSI** (HPMC)

TEMPERATURE*
248° F (HSMC & HPMC)

SPEED*
3,000 RPM (HSMC), **180 RPM** (HPMC)

THREADS
3/8" to 3/4" NPT or BSP

MATERIAL
Nickel Plated Steel

STANDARD NUMBER OF PORTS
2 to 8

** See Performance Charts For Details*

Features & Benefits

High Pressure Or High Speed Applications

Duff-Norton multi-port Rotary Unions are available in both high pressure (HPMC Series) and high speed (HSMC Series) configurations.

Pressures Up To 5,880 psi

HPMC Series Rotary Unions are designed for higher pressure, available with up to eight ports as standard and are suitable for use in low speed applications for pressures up to 5,880 psi.

Available Up To 4 Ports

HSMC Series Rotary Unions are available with up to four ports as standard.

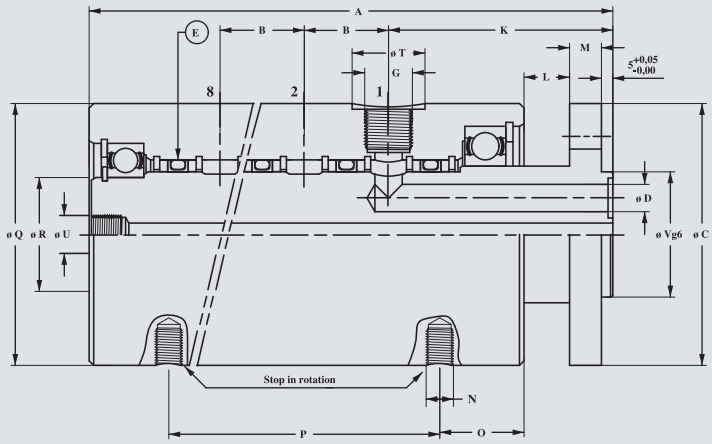
Speeds Up To 3,000 RPM

HSMC Series is perfect for low pressure applications, up to 175 psi with rotational speeds up to 3,000 rpm.

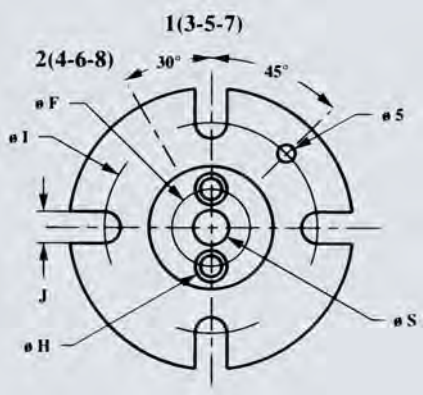
No Cross Contamination

Feel free to run dissimilar fluids through Duff-Norton Multi-Port Rotary Unions as each port is always individually sealed eliminating cross contamination between circuits.

HPMC Series



HPMC End

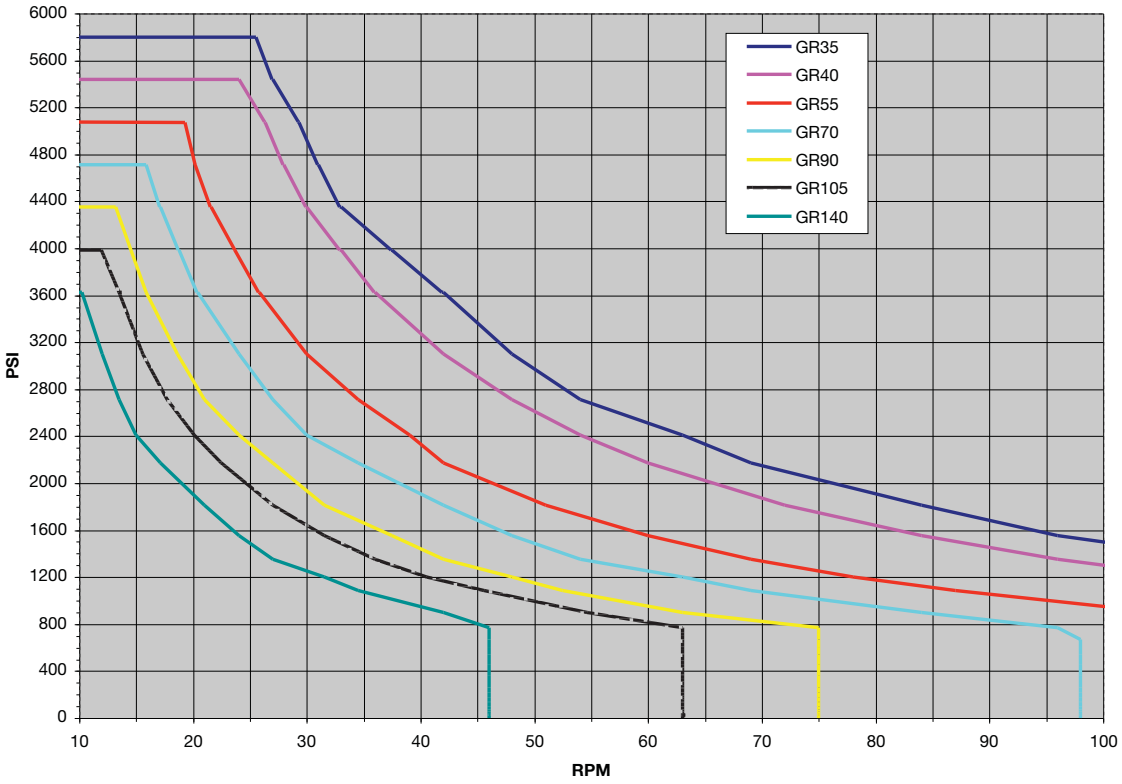


HPMC MULTI-PORT ROTARY UNIONS (in.)

Number of Ports	Part Number	Description	A	B	C	D	E & Vg6	F	G (NPT)	H	Ref. O-ring	I	J	K	L	M	N	O	P	Q	R	S	T	U
2	**750748C**	RMC206R2KNPT	5.89	1.04	3.15	0.24	35	0.87	1/8"	0.35	06X01.5	2.36	0.35	3.05	0.59	0.39	M8	1.26	2.26	3.15	1.18	0.39	0.71	3/8"
3	**750749C**	RMC306R2KNPT	6.93	1.04	3.15	0.24	35	0.87	1/8"	0.35	06X01.5	2.36	0.35	3.05	0.59	0.39	M8	1.26	3.31	3.15	1.18	0.39	0.71	3/8"
4	**750750C**	RMC406R2KNPT	7.97	1.04	3.15	0.24	35	0.87	1/8"	0.35	06X01.5	2.36	0.35	3.05	0.59	0.39	M8	1.26	4.35	3.15	1.18	0.39	0.71	3/8"
5	**750751C**	RMC506R2KNPT	9.02	1.04	3.15	0.24	35	0.87	1/8"	0.35	06X01.5	2.36	0.35	3.05	0.59	0.39	M8	1.26	5.39	3.15	1.18	0.39	0.71	3/8"
6	**750752C**	RMC606R2KNPT	10.06	1.04	3.15	0.24	35	0.87	1/8"	0.35	06X01.5	2.36	0.35	3.05	0.59	0.39	M8	1.26	6.44	3.15	1.18	0.39	0.71	3/8"
7	**750753C**	RMC706R2KNPT	12.32	1.14	3.94	0.24	40	1.06	1/8"	0.35	06X01.5	2.83	0.43	3.50	0.79	0.47	M8	1.26	8.43	3.54	1.38	0.47	0.71	1/2"
8	**750754C**	RMC806R2KNPT	13.46	1.14	3.94	0.24	40	1.06	1/8"	0.35	06X01.5	2.83	0.43	3.50	0.79	0.47	M8	1.26	9.57	3.54	1.38	0.47	0.71	1/2"
2	**750755C**	RMC208R2KNPT	6.77	1.22	3.94	0.31	40	0.94	1/4"	0.47	R6A	2.83	0.43	3.54	0.79	0.47	M10	1.26	2.87	3.54	1.38	0.31	0.87	1/4"
3	**750756C**	RMC308R2KNPT	7.99	1.22	3.94	0.31	40	0.94	1/4"	0.47	R6A	2.83	0.43	3.54	0.79	0.47	M10	1.26	4.09	3.54	1.38	0.31	0.87	1/4"
4	**750757C**	RMC408R2KNPT	9.21	1.22	3.94	0.31	40	0.94	1/4"	0.47	R6A	2.83	0.43	3.54	0.79	0.47	M10	1.26	5.31	3.54	1.38	0.31	0.87	1/4"
5	**750758C**	RMC508R2KNPT	10.43	1.22	3.94	0.31	40	1.02	1/4"	0.47	R6A	2.83	0.43	3.54	0.79	0.47	M10	1.26	6.54	3.54	1.38	0.39	0.87	3/8"
6	**750759C**	RMC608R2KNPT	12.48	1.30	4.53	0.31	55	1.48	1/4"	0.47	R6A	3.39	0.43	3.80	0.79	0.55	M10	1.46	8.11	4.53	1.97	0.47	0.87	1/2"
7	**750760C**	RMC708R2KNPT	13.78	1.30	4.53	0.31	55	1.48	1/4"	0.47	R6A	3.39	0.43	3.80	0.79	0.55	M10	1.46	9.41	4.53	1.97	0.47	0.87	1/2"
8	**750761C**	RMC808R2KNPT	15.08	1.30	4.53	0.31	55	1.48	1/4"	0.47	R6A	3.39	0.43	3.80	0.79	0.55	M10	1.46	10.71	4.53	1.97	0.47	0.87	1/2"
2	**750762C**	RMC210R2KNPT	6.93	1.30	3.94	0.39	40	0.94	3/8"	0.49	010X01.3	2.83	0.43	3.58	0.79	0.47	M10	1.26	3.03	3.54	1.38	0.31	0.98	1/4"
3	**750763C**	RMC310R2KNPT	8.23	1.30	3.94	0.39	40	0.94	3/8"	0.49	010X01.3	2.83	0.43	3.58	0.79	0.47	M10	1.26	4.33	3.54	1.38	0.31	0.98	1/4"
4	**750764C**	RMC410R2KNPT	9.53	1.30	3.94	0.39	40	0.94	3/8"	0.49	010X01.3	2.83	0.43	3.58	0.79	0.47	M10	1.26	5.63	3.54	1.38	0.31	0.98	1/4"
5	**750765C**	RMC510R2KNPT	11.57	1.38	4.53	0.39	55	1.34	3/8"	0.49	010X01.3	3.39	0.43	3.84	0.79	0.55	M10	1.46	7.20	4.53	1.97	0.47	0.98	1/2"
6	**750766C**	RMC610R2KNPT	12.95	1.38	4.53	0.39	55	1.34	3/8"	0.49	010X01.3	3.39	0.43	3.84	0.79	0.55	M10	1.46	8.58	4.53	1.97	0.47	0.98	1/2"
7	**750767C**	RMC710R2KNPT	14.33	1.38	4.53	0.39	55	1.34	3/8"	0.49	010X01.3	3.39	0.43	3.84	0.79	0.55	M10	1.46	9.96	4.53	1.97	0.47	0.98	1/2"
8	**750768C**	RMC810R2KNPT	16.26	1.38	5.51	0.39	70	1.85	3/8"	0.49	010X01.3	4.25	0.51	4.27	0.98	0.59	M12	1.57	11.42	5.31	2.56	0.71	0.98	3/4"
2	**750769C**	RMC212R2KNPT	7.60	1.46	4.53	0.47	55	1.26	1/2"	0.69	R10	3.39	0.43	3.88	0.79	0.55	M12	1.46	3.23	4.53	1.97	0.39	1.26	3/8"
3	**750770C**	RMC312R2KNPT	9.06	1.46	4.53	0.47	55	1.26	1/2"	0.69	R10	3.39	0.43	3.88	0.79	0.55	M12	1.46	4.69	4.53	1.97	0.39	1.26	3/8"
4	**750771C**	RMC412R2KNPT	10.51	1.46	4.53	0.47	55	1.26	1/2"	0.69	R10	3.39	0.43	3.88	0.79	0.55	M12	1.46	6.14	4.53	1.97	0.39	1.26	3/8"
5	**750772C**	RMC512R2KNPT	12.52	1.46	5.51	0.47	70	1.65	1/2"	0.69	R10	4.25	0.51	4.31	0.98	0.59	M12	1.57	7.72	5.31	2.56	0.47	1.26	1/2"
6	**750773C**	RMC612R2KNPT	15.20	1.54	6.69	0.47	90	2.13	1/2"	0.69	R10	5.20	0.67	4.80	1.18	0.63	M12	1.77	9.72	6.30	3.35	0.71	1.26	3/4"
7	**750774C**	RMC712R2KNPT	16.73	1.54	6.69	0.47	90	2.13	1/2"	0.69	R10	5.20	0.67	4.80	1.18	0.63	M12	1.77	11.26	6.30	3.35	0.71	1.26	3/4"
8	**750775C**	RMC812R2KNPT	18.27	1.54	6.69	0.47	90	2.13	1/2"	0.69	R10	5.20	0.67	4.80	1.18	0.63	M12	1.77	12.80	6.30	3.35	0.71	1.26	3/4"
2	**750776C**	RMC218R2KNPT	8.66	1.69	5.51	0.71	70	1.50	3/4"	0.94	R14	4.25	0.51	4.43	0.98	0.59	M12	1.57	3.86	5.31	2.56	0.39	1.46	3/8"
3	**750777C**	RMC318R2KNPT	10.35	1.69	5.51	0.71	70	1.50	3/4"	0.94	R14	4.25	0.51	4.43	0.98	0.59	M12	1.57	5.55	5.31	2.56	0.39	1.46	3/8"
4	**750778C**	RMC418R2KNPT	12.05	1.69	5.51	0.71	70	1.50	3/4"	0.94	R14	4.25	0.51	4.43	0.98	0.59	M12	1.57	7.24	5.31	2.56	0.39	1.46	3/8"
5	**750779C**	RMC518R2KNPT	14.84	1.77	6.69	0.71	90	2.20	3/4"	0.94	R14	5.20	0.67	4.92	1.18	0.63	M12	1.77	9.37	6.30	3.35	0.71	1.46	3/4"
2	**750780C**	RMC225R2KNPT	10.08	2.05	6.69	0.98	90	1.97	1"	1.26	R19	5.20	0.67	5.06	1.18	0.63	M14	1.77	4.61	6.30	3.35	0.47	1.69	1/2"
3	**750781C**	RMC325R2KNPT	12.13	2.05	6.69	0.98	90	1.97	1"	1.26	R19	5.20	0.67	5.06	1.18	0.63	M14	1.77	6.65	6.30	3.35	0.47	1.69	1/2"
4	**750782C**	RMC425R2KNPT	14.17	2.05	6.69	0.98	90	1.97	1"	1.26	R19	5.20	0.67	5.06	1.18	0.63	M14	1.77	8.70	6.30	3.35	0.47	1.69	1/2"
5	**750783C**	RMC525R2KNPT	17.32	2.17	7.48	0.98	105	2.72	1"	1.26	R19	5.91	0.67	5.41	1.18	0.63	M14	2.05	11.38	7.48	3.94	0.71	1.69	3/4"
2	**750784C**	RMC231R2KNPT	11.30	2.40	7.48	1.22	105	2.24	1-1/4"	1.44	R22	5.91	0.67	5.53	1.18	0.63	M14	2.05	5.35	7.48	3.94	0.47	2.17	1/2"
3	**750785C**	RMC331R2KNPT	13.70	2.40	7.48	1.22	105	2.24	1-1/4"	1.44	R22	5.91	0.67	5.53	1.18	0.63	M14	2.05	7.76	7.48	3.94	0.47	2.17	1/2"
4	**750786C**	RMC431R2KNPT	16.10	2.40	7.48	1.22	105	2.24	1-1/4"	1.44	R22	5.91	0.67	5.53	1.18	0.63	M14	2.05	10.16	7.48	3.94	0.47	2.17	1/2"
5	**750787C**	RMC531R2KNPT	20.87	2.64	9.06	1.22	140	3.43	1-1/4"	1.44	R22	7.24	0.67	6.28	1.18	0.79	M16	2.44	13.90	9.06	5.12	0.71	2.17	3/4"

Performance Charts

HPMC SERIES



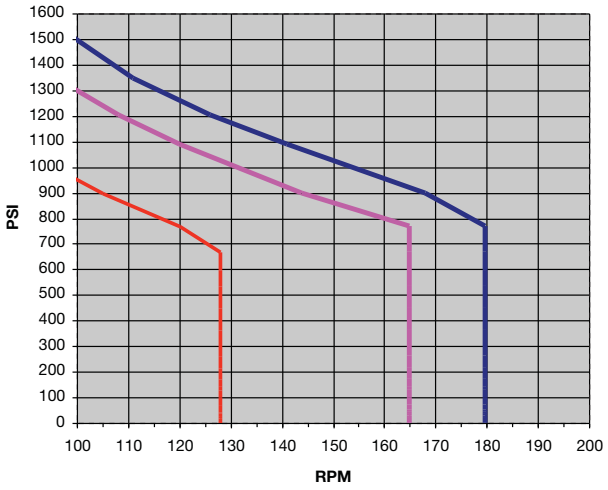
GR seals are used in these High Pressure Multi-Circuit Models						
GR35	**GR40**	**GR55**	**GR70**	**GR90**	**GR105**	**GR140**
MC206R2K	MC706R2K	MC608R2K	MC810R2K	MC612R2K	MC525R2K	MC531R2K
MC306R2K	MC806R2K	MC708R2K	MC512R2K	MC712R2K	MC231R2K	
MC406R2K	MC208R2K	MC808R2K	MC218R2K	MC812R2K	MC331R2K	
MC506R2K	MC308R2K	MC510R2K	MC318R2K	MC518R2K	MC431R2K	
MC606R2K	MC408R2K	MC610R2K	MC418R2K	MC618R2K		
	MC508R2K	MC710R2K		MC225R2K		
	MC210R2K	MC212R2K		MC325R2K		
	MC310R2K	MC312R2K		MC425R2K		
	MC410R2K	MC412R2K				

Performance charts are for oil, grease or similar lubricating media. For media such as water or air, reduce the maximum recommended speed as follows:

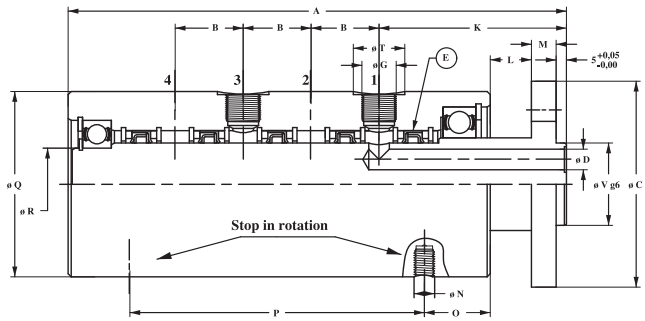
For Water: Multiply speed by 0.67
For Air: Multiply speed by 0.33

Where maximum recommended speeds are found on the horizontal axis.

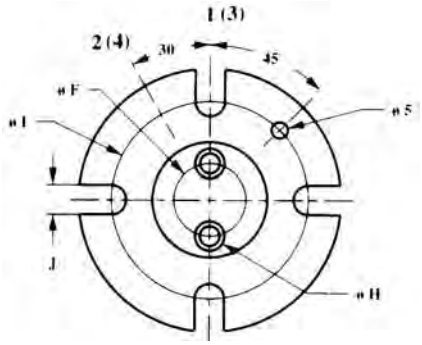
HPMC SERIES OVER 100 RPM



HSMC Series



HSMC End

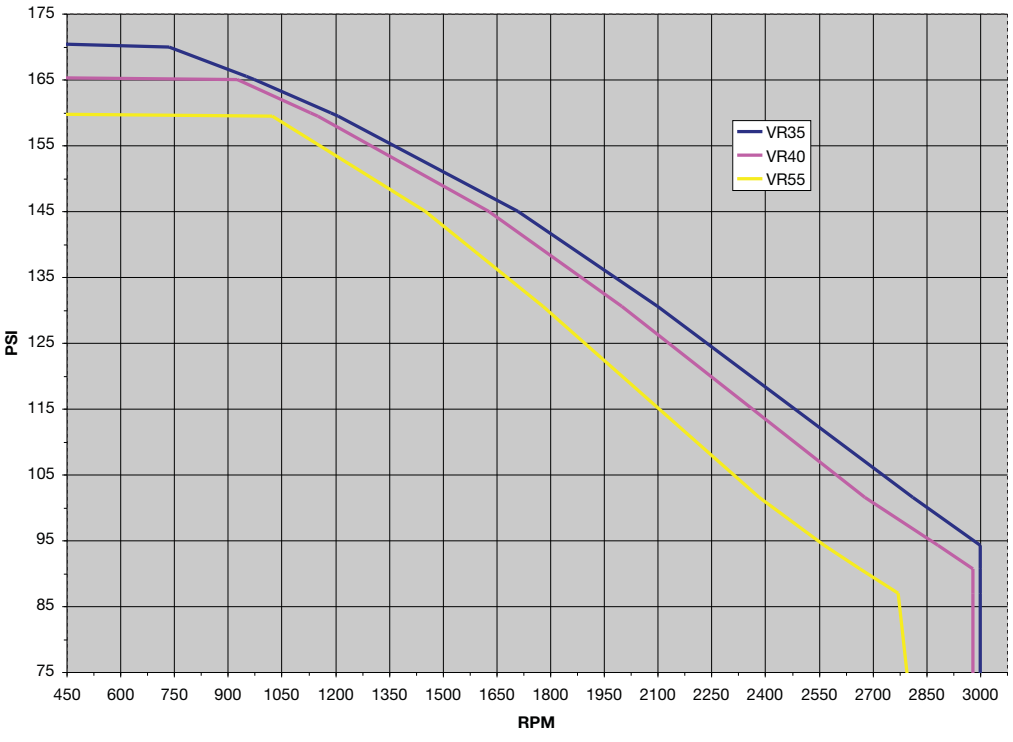


HSMC MULTI-PORT ROTARY UNIONS (in.)

Number of Ports	Part Number	Description	A	B	C	D	V	F	G (NPT)	H	Ref. O-ring	I	J	K	L	M	N	O	P	Q	R	T
2	**750889C**	RMC206RVRKNPT	5.89	1.04	3.15	0.24	35	0.87	1/8"	0.35	06X01.5	2.36	0.35	3.05	0.59	0.39	M8	1.26	2.26	3.15	1.18	0.71
3	**750809C**	RMC306RVRKNPT	6.93	1.04	3.15	0.24	35	0.87	1/8"	0.35	06X01.5	2.36	0.35	3.05	0.59	0.39	M8	1.26	3.31	3.15	1.18	0.71
4	**750810C**	RMC406RVRKNPT	7.97	1.04	3.15	0.24	35	0.87	1/8"	0.35	06X01.5	2.36	0.35	3.05	0.59	0.39	M8	1.26	4.35	3.15	1.18	0.71
2	**750811C**	RMC208RVRKNPT	6.77	1.22	3.94	0.31	40	0.94	1/4"	0.47	R6A	2.83	0.43	3.54	0.79	0.47	M10	1.26	2.87	3.54	1.38	0.87
3	**750812C**	RMC308RVRKNPT	7.99	1.22	3.94	0.31	40	0.94	1/4"	0.47	R6A	2.83	0.43	3.54	0.79	0.47	M10	1.26	4.09	3.54	1.38	0.87
4	**750813C**	RMC408RVRKNPT	9.21	1.22	3.94	0.31	40	0.94	1/4"	0.47	R6A	2.83	0.43	3.54	0.79	0.47	M10	1.26	5.31	3.54	1.38	0.87
2	**750814C**	RMC210RVRKNPT	6.93	1.30	3.94	0.39	40	0.94	3/8"	0.49	010X01.3	2.83	0.43	3.58	0.79	0.47	M10	1.26	3.03	3.54	1.38	0.98
3	**750815C**	RMC310RVRKNPT	8.23	1.30	3.94	0.39	40	0.94	3/8"	0.49	010X01.3	2.83	0.43	3.58	0.79	0.47	M10	1.26	4.33	3.54	1.38	0.98
4	**750816C**	RMC410RVRKNPT	9.53	1.30	3.94	0.39	40	0.94	3/8"	0.49	010X01.3	2.83	0.43	3.58	0.79	0.47	M10	1.26	5.63	3.54	1.38	0.98

Performance Charts

HSMC SERIES



VR seals are used in these High Speed Multi-Circuit Models		
GR35	**GR40**	**GR55**
MC206R VR	MC208R VR	MC212R VR
MC306R VR	MC308R VR	MC312R VR
MC406R VR	MC408R VR	MC412R VR
	MC210R VR	
	MC310R VR	
	MC410R VR	

Performance chart is for lubricated air, dry air, liquid and oils.

Maximum recommended speeds are found on the horizontal axis.

1600 SERIES

TWO PORT ROTARY UNION

Operating Parameters

MEDIA

Water, Air, Hydraulic Fluid

PRESSURE*

2,900 PSI

TEMPERATURE*

250° F

SPEED*

1,500 RPM

THREADS

- 1/4" to 1" NPT
- BSP & BSPP Available

MATERIAL

Nickel Plated Steel

Also available in all stainless steel with a hardened ceramic shaft for higher speed and longer life.

STANDARD NUMBER OF PORTS

Two Port Design

** See Performance Charts For Details*

Features & Benefits

Two Port Design

Features two ports for use in a wide variety of applications.

Corrosion Resistant

Nickel plated steel for corrosion resistance. Also available in all stainless steel and with a hardened ceramic shaft for higher speeds and longer life.

Medium Speed & Medium Pressure Capable

Offers the ability to use medium speed and pressure simultaneously.

No Cross Contamination

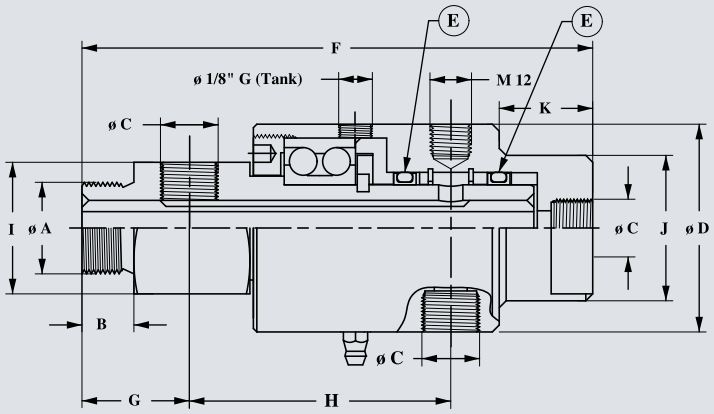
The 1600 Series can be used with two dissimilar fluids. All circuits are individually sealed eliminating cross contamination.

1600 SERIES TWO PORT ROTARY UNIONS

PART NUMBERS

Nominal Pipe Size	Nickel Plated Steel				Hardened Shaft			
	Left Hand Thread		Right Hand Thread		Left Hand Thread		Right Hand Thread	
	Part Number	Description	Part Number	Description	Part Number	Description	Part Number	Description
2 x 1/4	**760607C**	L16191/4KNPT	**760612C**	R16191/4KNPT	**760617C**	L16191/4KCNPT	**760622C**	R16191/4KCNPT
2 x 3/8	**760608C**	L16833/8KNPT	**760613C**	R16833/8KNPT	**760618C**	L16833/8KCNPT	**760623C**	R16833/8KCNPT
2 x 1/2	**760609C**	L16441/2KNPT	**760614C**	R16441/2KNPT	**760619C**	L16441/2KCNPT	**760624C**	R16441/2KCNPT
2 x 3/4	**760610C**	L16443/4KNPT	**760615C**	R16443/4KNPT	**760620C**	L16443/4KCNPT	**760625C**	R16443/4KCNPT
2 x 1	**760611C**	L17601KNPT	**760616C**	R17601KNPT	**760621C**	L17601KCNPT	**760626C**	R17601KCNPT

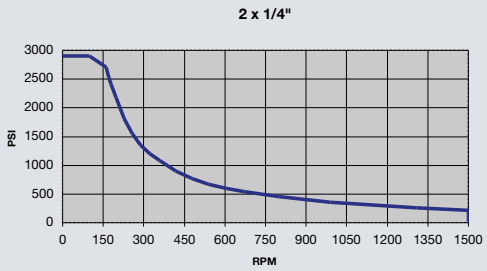
*2 seals per joint

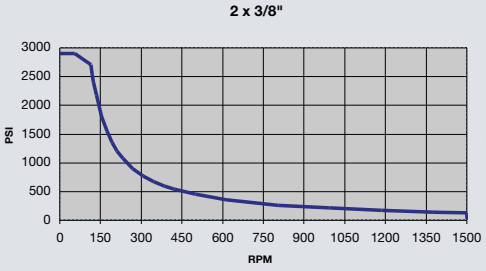


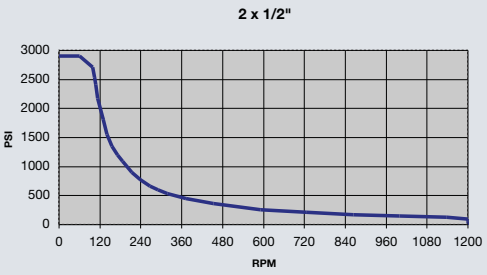
DIMENSIONS	1600 SERIES TWO PORT ROTARY UNIONS (in.)												
	Nominal Pipe Size	Shaft Thread (A)	B	Inlet Thread C	D	E*	F	G	H	I	J	Flats on (J) Diameter	K
	2 x 1/4	1/2	.50	1/4	1.96	466790C	4.05	.94	1.88	1.06	1.18	.94	.47
	2 x 3/8	3/4	.59	3/8	2.36	466794C	5.62	1.22	2.83	1.49	1.65	1.49	.47
	2 x 1/2	1	.78	1/2	3.14	466796C	7.87	1.57	3.81	2.12	1.96	1.77	.59
	2 x 3/4	1	.78	3/4	3.14	466796C	7.12	1.57	3.81	2.12	1.96	1.77	.59
	2 x 1	1-1/2	.78	1	3.54	466799C	9.72	2.04	5	3.54	2.36	1.96	.70

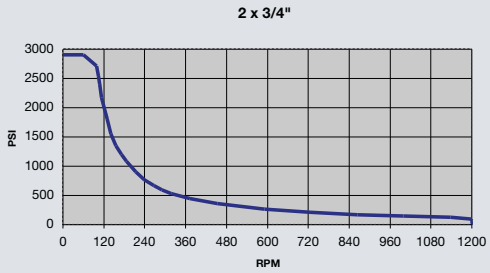
*2 seals per joint

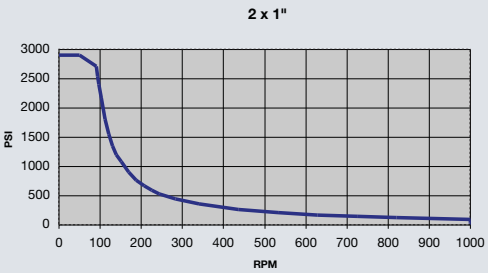
Performance Charts











Performance charts are for oil, grease or similar lubricating media. For media such as water or air, reduce the maximum recommended speed as follows:

For Water: Multiply speed by 0.67

For Air: Multiply speed by 0.33

Where maximum recommended speeds are found on the horizontal axis.

Standard Materials

1650 SERIES

TWO PORT ROTARY UNION

Operating Parameters

MEDIA

Water, Air, Hydraulic Fluid

PRESSURE*

2,900 PSI

TEMPERATURE*

250° F

SPEED*

1,500 RPM

THREADS

- 1/4" to 1" NPT
- BSP & BSPP Available

MATERIAL

Nickel Plated Steel

Also available in all stainless steel with a hardened ceramic shaft for higher speed and longer life.

STANDARD NUMBER OF PORTS

Two Port Design

** See Performance Charts For Details*

Features & Benefits

Two Port Design

Features two circuits for use in a wide variety of applications.

Corrosion Resistant

Nickel plated steel for corrosion resistance. Also available in all stainless steel and with a hardened ceramic shaft for higher speeds and longer life.

Medium Speed & Medium Pressure Capable

Offers the ability to use medium speed and pressure simultaneously.

No Cross Contamination

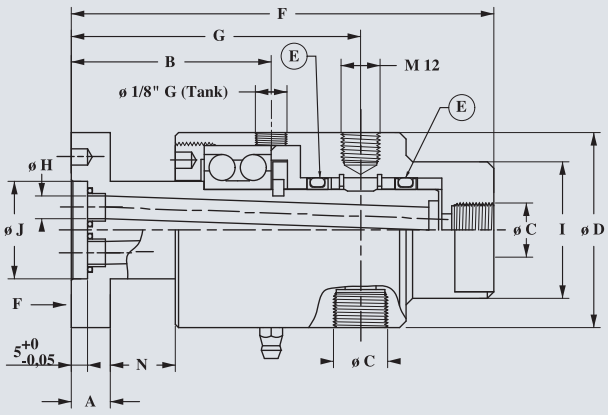
Can be used with two dissimilar fluids. All circuits are individually sealed to eliminate cross contamination.

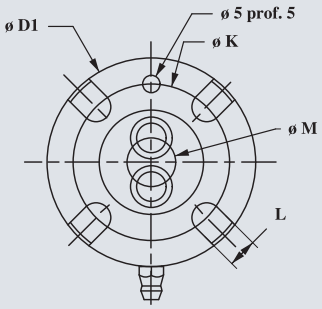
PART NUMBERS

1650 SERIES TWO PORT ROTARY UNIONS

Nominal Pipe Size	Nickel Plated Steel				Stainless Steel			
	Nickel Plated Steel Shaft		Hardened Shaft		Nickel Plated Steel Shaft		Hardened Shaft	
	Part Number	Description	Part Number	Description	Part Number	Description	Part Number	Description
1/4	**760559C**	F1619BKNPT	**760592C**	F1619BKCNPT	**760597C**	F1619BINPT	**760602C**	F1619BICNPT
3/8	**760560C**	F1683BKNPT	**760593C**	F1683BKCNPT	**760598C**	F1683BINPT	**760603C**	F1683BICNPT
1/2	**760561C**	F1644BK1/2NPT	**760594C**	F1644BKC1/2NPT	**760599C**	F1644BI1/2NPT	**760604C**	F1644BIC1/2NPT
3/4	**760562C**	F1644BK3/4NPT	**760595C**	F1644BKC3/4NPT	**760600C**	F1644BI3/4NPT	**760605C**	F1644BIC3/4NPT
1	**760563C**	F1760BKNPT	**760596C**	F1760BKCNPT	**760601C**	F1760BINPT	**760606C**	F1760BICNPT

* 2 seals per joint





1650 SERIES TWO PORT ROTARY UNIONS (in.)

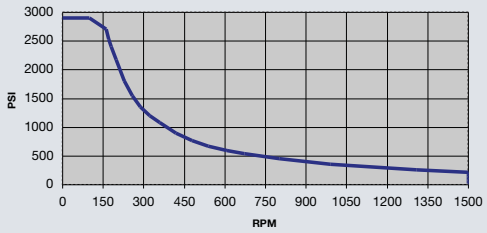
DIMENSIONS

Nominal Pipe Size	A	B	NPT C	D	E*	F	G	H	I	Flats on (I) Diameter	J	K	L	M
1/4	.47	1.73	1/4	1.96	GR15	3.85	2.55	.11	1.18	.94	.78	1.37	.33	.39
3/8	.47	2.42	3/8	2.36	GR25	5.11	3.5	.27	1.65	1.49	1.18	1.77	.33	.55
1/2	.47	2.63	1/2	3.14	GR35	6.49	3.85	.47	1.96	1.77	1.77	2.55	.33	.82
3/4	.47	2.63	3/4	3.14	GR35	5.70	3.85	.47	1.96	1.77	1.77	2.55	.33	.82
1	.59	3.79	1	3.54	GR50	8.26	5.51	.70	2.36	1.96	2.36	3.14	.43	1.14

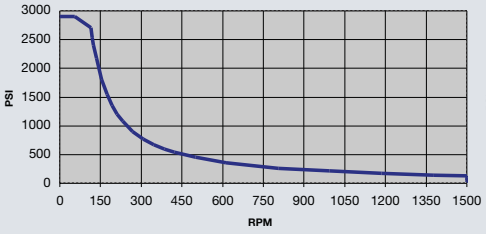
* 2 seals per joint

Performance Charts

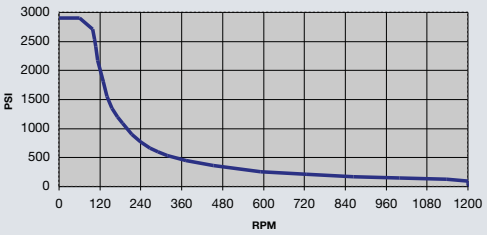
2 x 1/4"



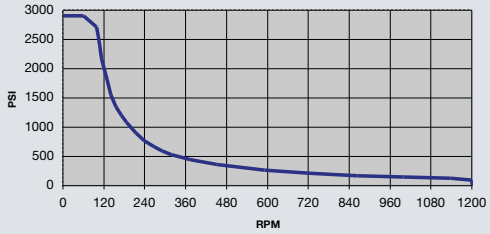
2 x 3/8"



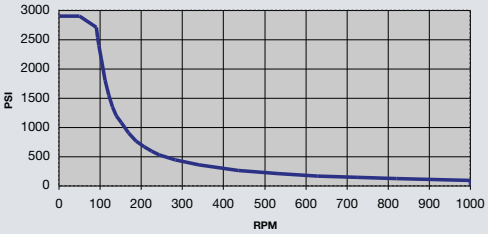
2 x 1/2"



2 x 3/4"



2 x 1"



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For Water: Multiply speed by 0.67

For Air: Multiply speed by 0.33

Where maximum recommended speeds are found on the horizontal axis.

Standard Materials

COLD WATER
ROTARY UNION

Operating Parameters

SPEED	TEMPERATURE
700 RPM	200° F
PRESSURE	**MEDIA**
150 PSI	Water
SIZES	
3/8" to 2" NPT	

Product Features

- Silicon carbide / carbon graphite seal faces
- Short dry run capability for initial machine start up
- Balanced seal design
- High precision ball bearings
- Internal bearing protection and vented body
- Long service life and good stability
- No maintenance required
- Mono flow and dual flow models available

Industries

- Plastics
- Rubber
- Flexible Packaging
- Printing

Applications

- Heating & Cooling Rolls
- Mixers
- Plastic Extruders
- Embossing Rolls
- Calendars

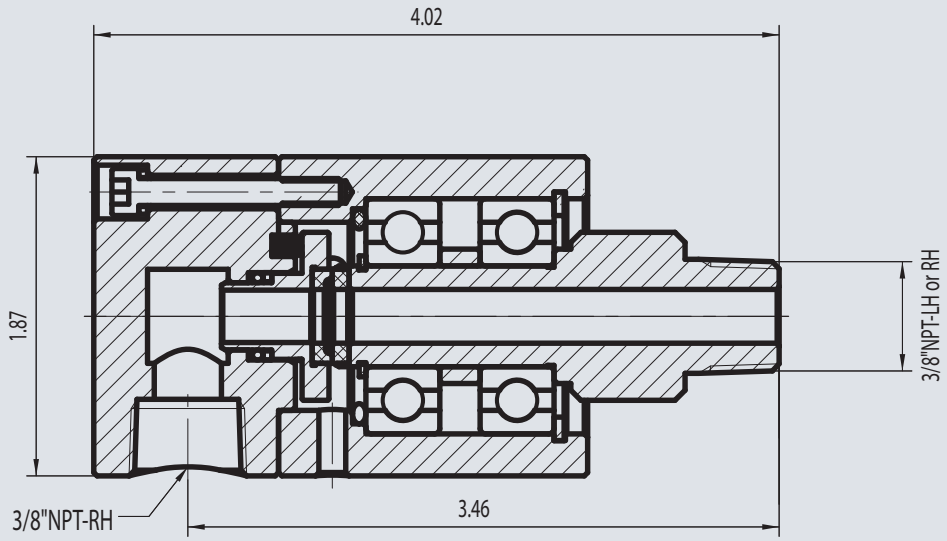
COLD WATER ROTARY UNION • MONO FLOW

Thread Size	Part Number	Thread Rotation	Description
3/8"	790160C	Left Hand	3/8" Cold Water Rotary Union, NPT, Mono Flow
	790161C	Right Hand	
1/2"	790162C	Left Hand	1/2" Cold Water Rotary Union, NPT, Mono Flow
	790163C	Right Hand	
3/4"	790164C	Left Hand	3/4" Cold Water Rotary Union, NPT, Mono Flow
	790165C	Right Hand	
1"	790166C	Left Hand	1" Cold Water Rotary Union, NPT, Mono Flow
	790167C	Right Hand	
1-1/4"	790168C	Left Hand	1-1/4" Cold Water Rotary Union, NPT, Mono Flow
	790169C	Right Hand	
1-1/2"	790170C	Left Hand	1-1/2" Cold Water Rotary Union, NPT, Mono Flow
	790171C	Right Hand	
2"	790172C	Left Hand	2" Cold Water Rotary Union, NPT, Mono Flow
	790173C	Right Hand	

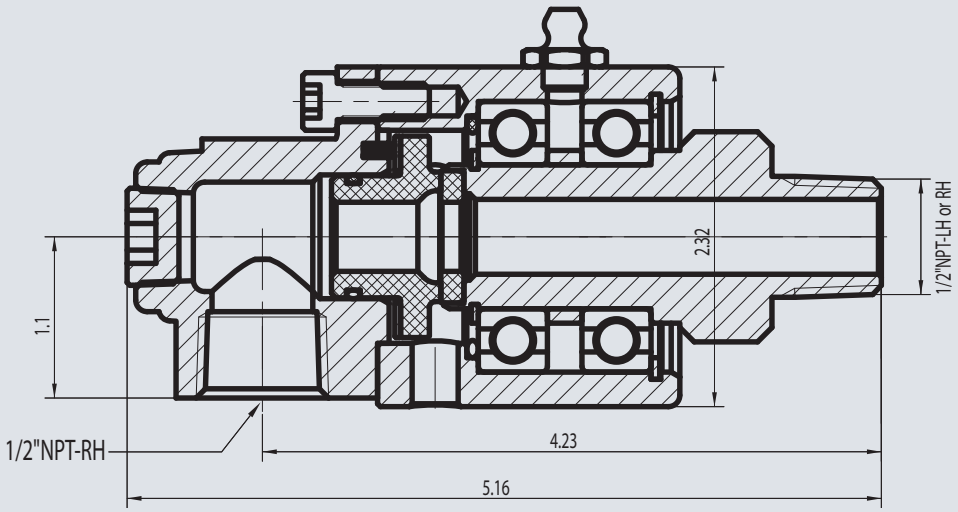
COLD WATER ROTARY UNION • DUAL FLOW

Thread Size	Part Number	Thread Rotation	Description
1/2"	790221C	Left Hand	1/2" Cold Water Rotary Union, NPT, Dual Flow, K= 1/8"
	790222C	Right Hand	
3/4"	790223C	Left Hand	3/4" Cold Water Rotary Union, NPT, Dual Flow, K= 1/4"
	790224C	Right Hand	
1"	790225C	Left Hand	1" Cold Water Rotary Union, NPT, Dual Flow, K= 3/8"
	790226C	Right Hand	
1-1/4"	790227C	Left Hand	1-1/4" Cold Water Rotary Union, NPT, Dual Flow, K= 1/2
	790228C	Right Hand	
1-1/2"	790229C	Left Hand	1-1/2" Cold Water Rotary Union, NPT, Dual Flow, K= 3/4"
	790230C	Right Hand	
2"	790231C	Left Hand	2" Cold Water Rotary Union, NPT, Dual Flow, K= 1"
	790232C	Right Hand	

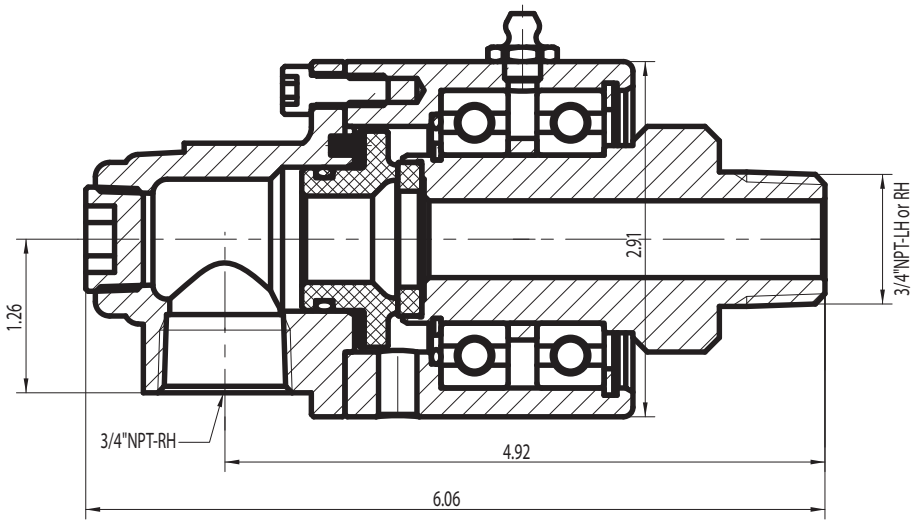
3/8” NPT Mono Flow



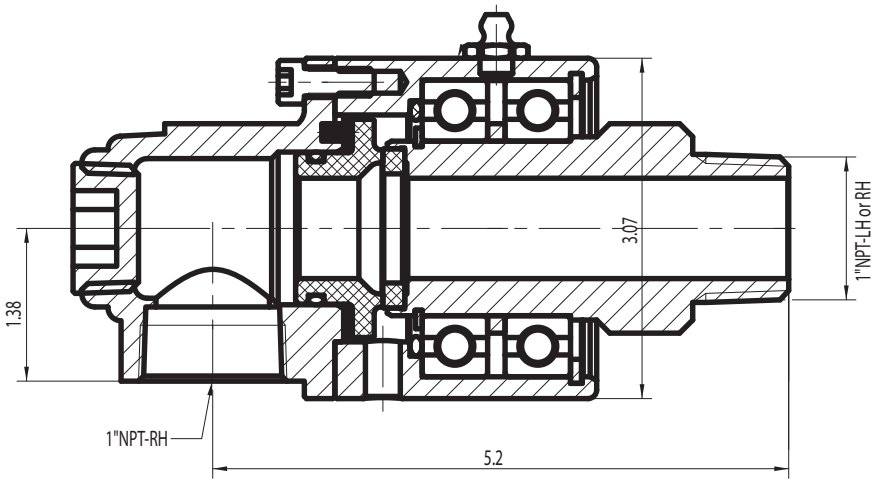
1/2” NPT Mono Flow



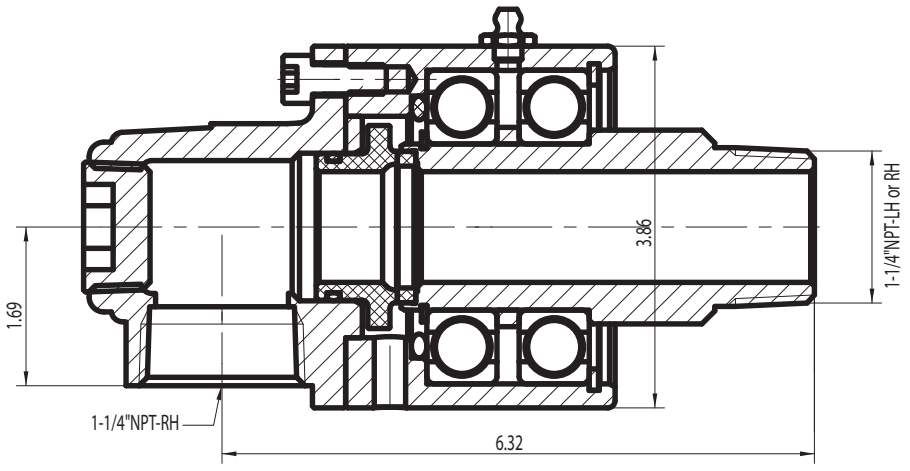
3/4” NPT Mono Flow



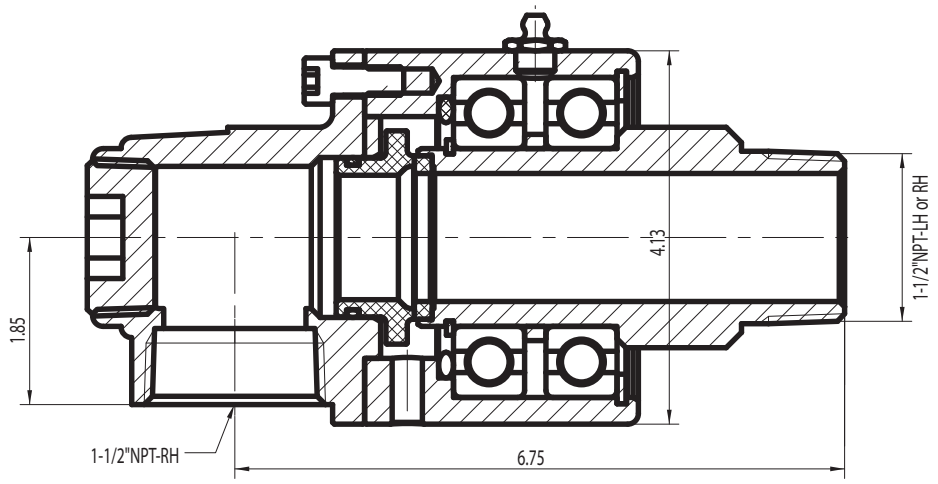
1” NPT Mono Flow



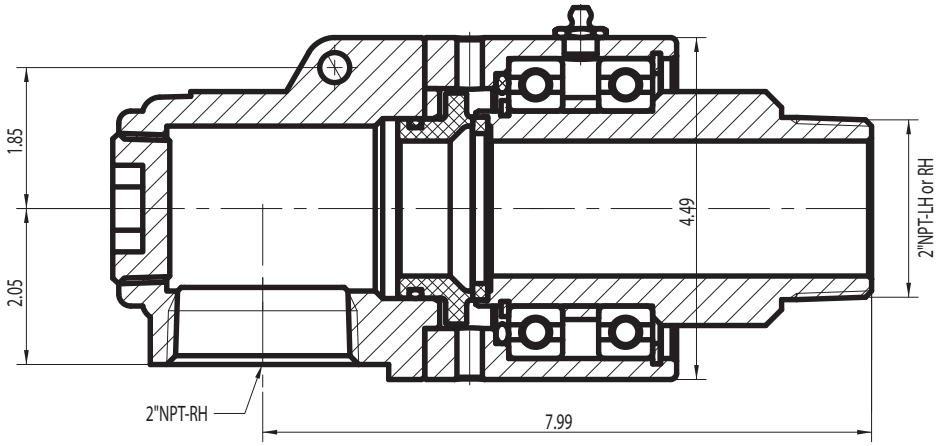
1 1/4” NPT Mono Flow



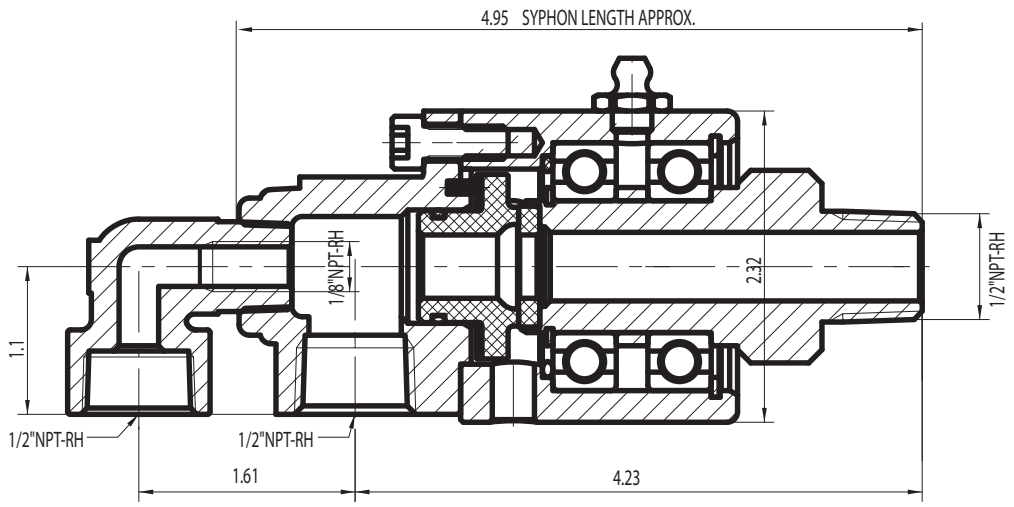
1 1/2” NPT Mono Flow



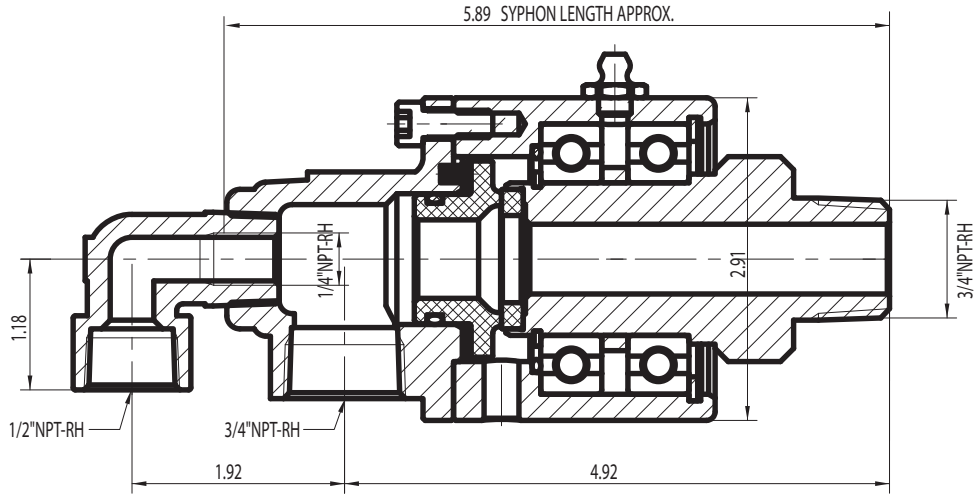
2” NPT Mono Flow



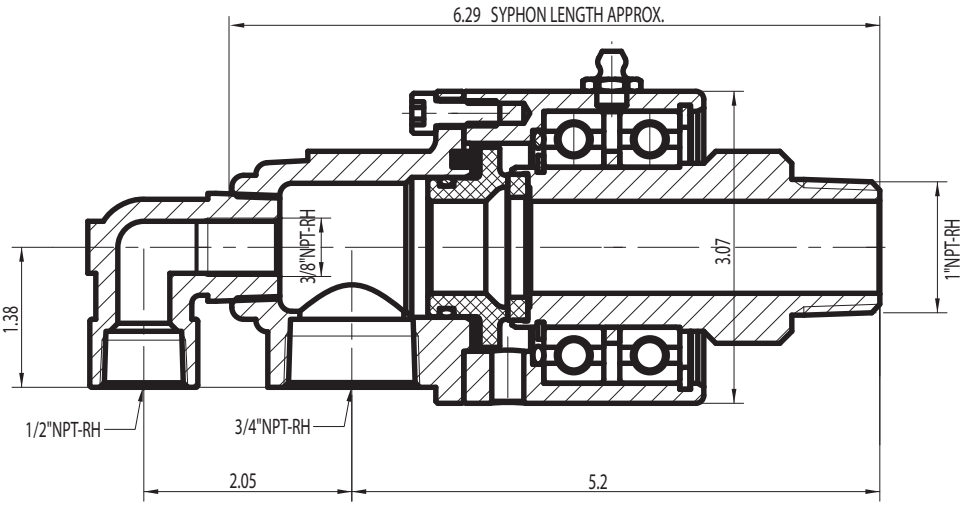
1/2” NPT Dual Flow



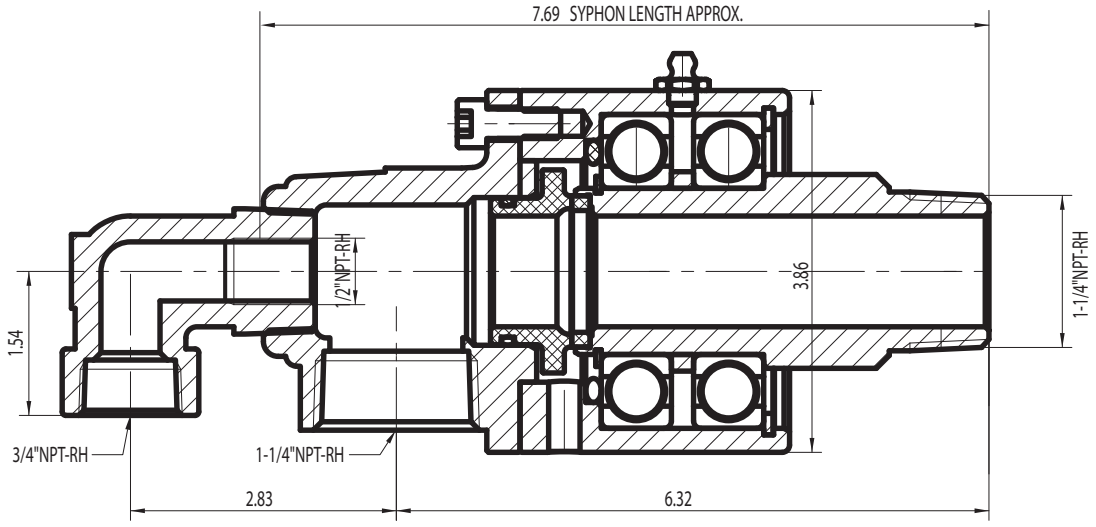
3/4” NPT Dual Flow



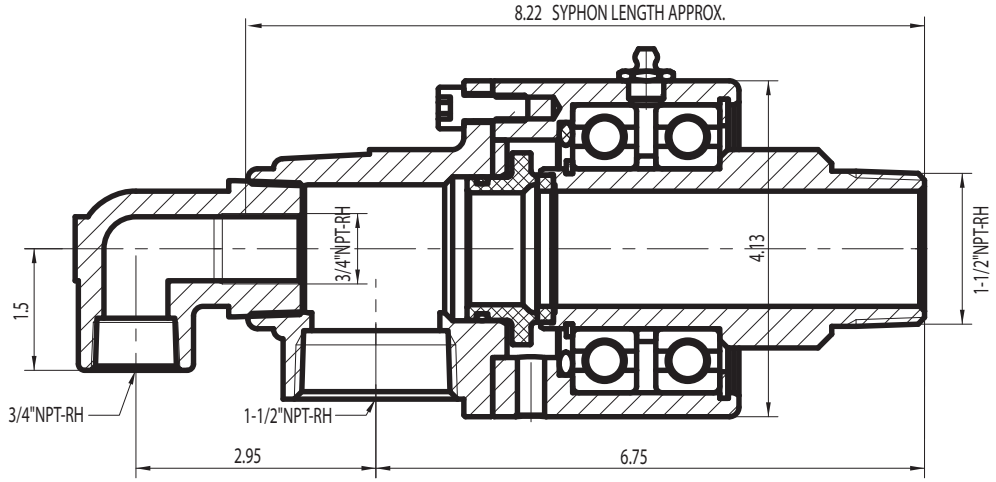
1” NPT Dual Flow



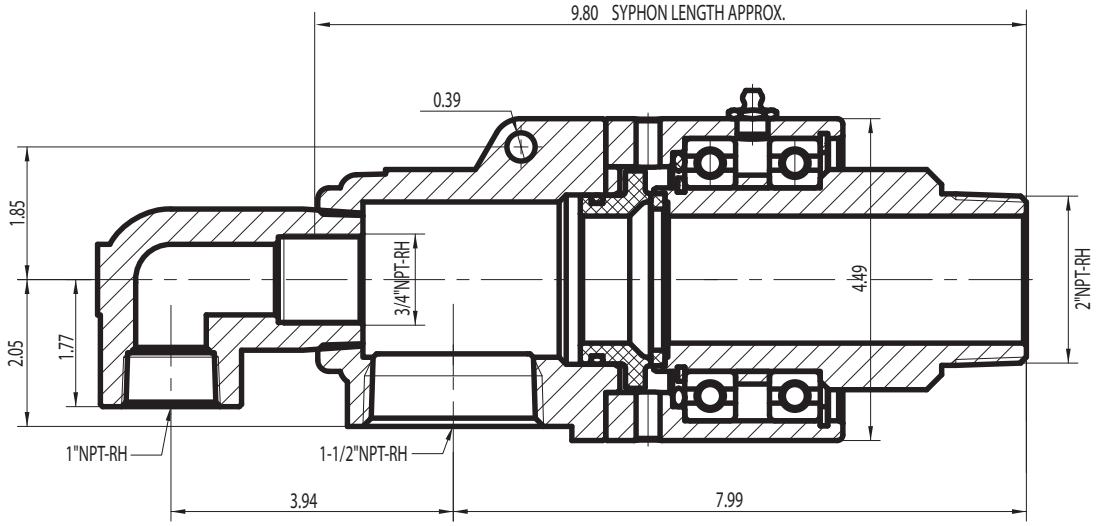
1 1/4” NPT Dual Flow



1 1/2” NPT Dual Flow



2” NPT Dual Flow



500 SERIES

AROUND THE SHAFT

Operating Parameters

MEDIA	**PRESSURE***
Water, Air, Hydraulic Fluid	5,800 PSI
TEMPERATURE*	**SPEED***
392º F	3,000 RPM
THREADS	**MATERIAL**
1/4" to 1/2" NPT or BSPP	Nickel Treated Carbon Steel Construction

** See Performance Charts For Details*

Features & Benefits

Shaft Mounted Design

Used in conjunction with the customer's shaft and retaining sleeve.

Two Configurations

High speed, low pressure applications, or high pressure, low speed applications.

High Pressure, Low Speed

High pressure, low speed models can be used at pressures to 5,800 psi and speeds less than 100 RPM.

High Speed, Low Pressure

High speed, low pressure models can be used at speeds to 3,000 RPM, and pressures to 175 psi.

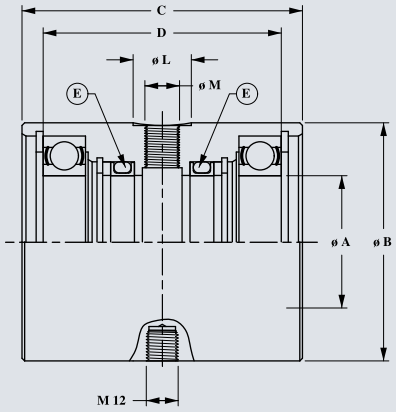
500 SERIES ROTARY UNIONS

PART NUMBERS

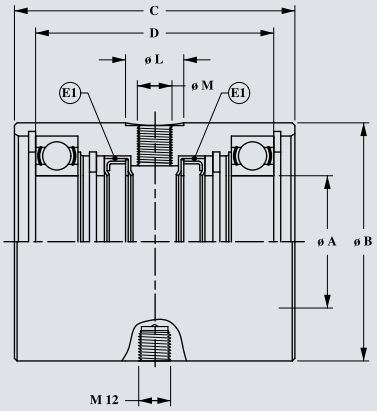
Customer Shaft Size	Nickel Plated Steel				Stainless Steel			
	High Pressure, Low Speed		High Speed, Low Pressure		High Pressure, Low Speed		High Speed, Low Pressure	
	Part Number	Description	Part Number	Description	Part Number	Description	Part Number	Description
20mm	**750905C**	BAT20RK	**750935C**	BAT20RKVR	**750920C**	BAT20RI	**750950C**	BAT20RIVR
30mm	**750906C**	BAT30RK	**750936C**	BAT30RKVR	**750921C**	BAT30RI	**750951C**	BAT30RIVR
40mm	**750907C**	BAT40RK	**750937C**	BAT40RKVR	**750922C**	BAT40RI	**750952C**	BAT40RIVR
45mm	**750908C**	BAT45RK	**750938C**	BAT45RKVR	**750923C**	BAT45RI	**750953C**	BAT45RIVR
50mm	**750909C**	BAT50RK	**750939C**	BAT50RKVR	**750924C**	BAT50RI	**750954C**	BAT50RIVR
55mm	**750910C**	BAT55RK	**750940C**	BAT55RKVR	**750925C**	BAT55RI	**750955C**	BAT55RIVR
60mm	**750911C**	BAT60RK	**750941C**	BAT60RKVR	**750926C**	BAT60RI	**750956C**	BAT60RIVR
65mm	**750912C**	BAT65RK	**750942C**	BAT65RKVR	**750927C**	BAT65RI	**750957C**	BAT65RIVR
70mm	**750913C**	BAT70RK	**750943C**	BAT70RKVR	**750928C**	BAT70RI	**750958C**	BAT70RIVR
75mm	**750914C**	BAT75RK	**750944C**	BAT75RKVR	**750929C**	BAT75RI	**750959C**	BAT75RIVR
80mm	**750915C**	BAT80RK	**750945C**	BAT80RKVR	**750930C**	BAT80RI	**750960C**	BAT80RIVR
85mm	**750916C**	BAT85RK	**750946C**	BAT85RKVR	**750931C**	BAT85RI	**750961C**	BAT85RIVR
90mm	**750917C**	BAT90RK	**750947C**	BAT90RKVR	**750932C**	BAT90RI	**750962C**	BAT90RIVR
95mm	**750918C**	BAT95RK	**750948C**	BAT95RKVR	**750933C**	BAT95RI	**750963C**	BAT95RIVR
100mm	**750919C**	BAT100RK	**750949C**	BAT100RKVR	**750934C**	BAT100RI	**750964C**	BAT100RIVR

*2 seals per joint

High Speed, Low Pressure



High Pressure, Low Speed



500 SERIES ROTARY UNION (in.)

DIMENSIONS

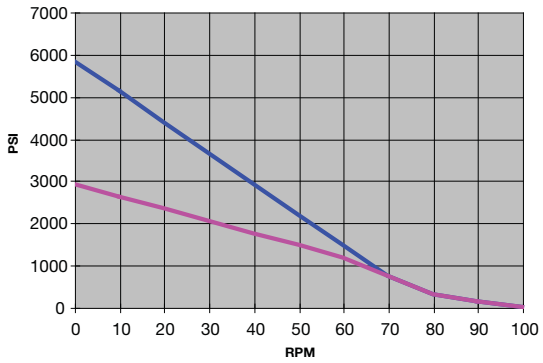
Customer Shaft Size	A	B	C	D	E*	E1*	L	M
20mm	0.75	2.16	3.50	3.03	GR20	OAB20	.86	.25
30mm	1.18	2.55	3.58	3.03	GR30	OAB30	.86	.25
40mm	1.57	2.95	3.93	3.38	GR40	OAB40	.86	.25
45mm	1.77	3.34	4.09	3.54	GR45	OAB45	.86	.25
50mm	1.96	3.54	4.17	3.54	GR50	OAB50	.86	.25
55mm	2.16	3.93	4.68	4.05	GR55	OAB55	1.25	.50
60mm	2.36	4.13	4.76	4.13	GR60	OAB60	1.25	.50
65mm	2.55	4.33	4.84	4.21	GR65	OAB65	1.25	.50
70mm	2.75	4.72	5.00	4.21	GR70	OAB70	1.25	.50
75mm	2.95	4.92	5.27	4.48	GR75	OAB75	1.25	.50
80mm	3.14	5.31	5.43	4.64	GR80	OAB80	1.25	.50
85mm	3.34	5.51	5.51	4.72	GR85	OAB85	1.25	.50
90mm	3.54	5.90	5.59	4.80	GR90	OAB90	1.25	.50
95mm	3.74	6.10	5.78	5.00	GR95	OAB95	1.25	.50
100mm	3.93	6.29	6.02	5.07	GR100	OAB100	1.25	.50

*2 seals per joint

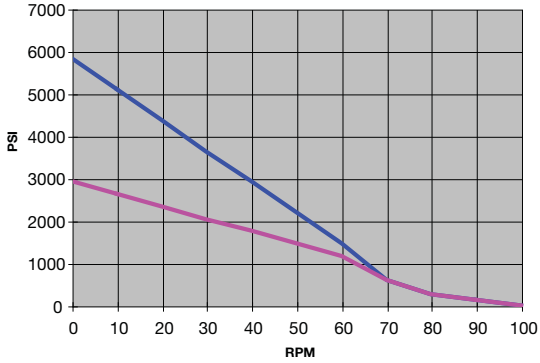
Performance Charts

500 Series - High Pressure

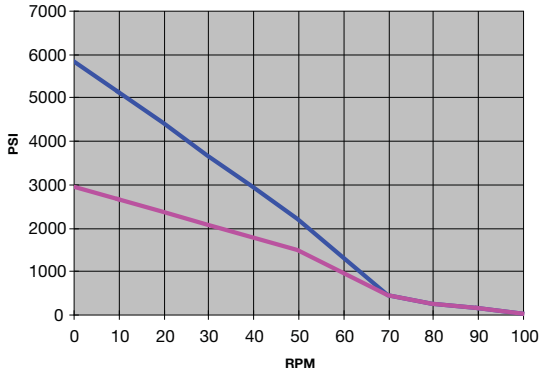
20mm



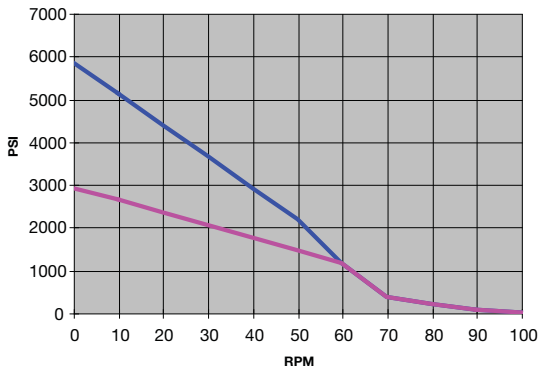
30mm



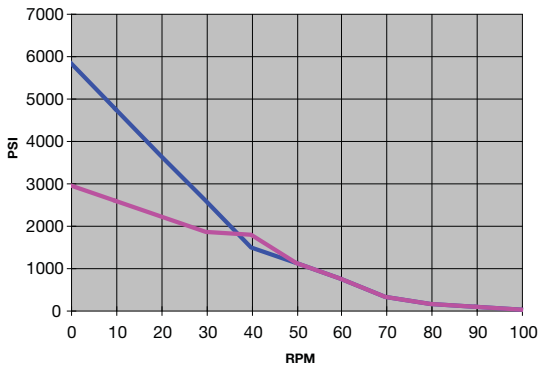
40mm



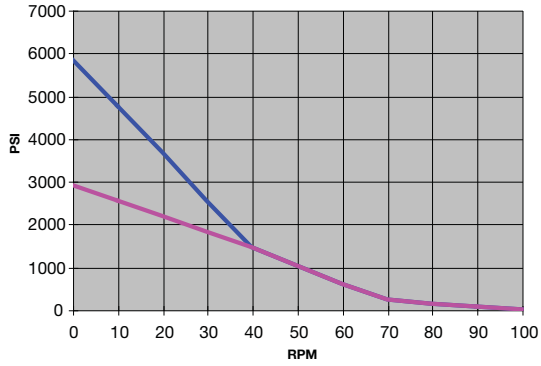
45mm



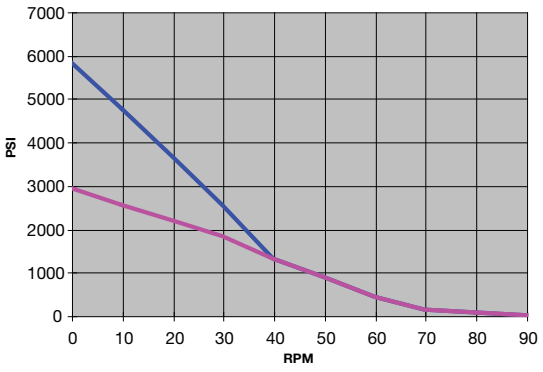
50mm



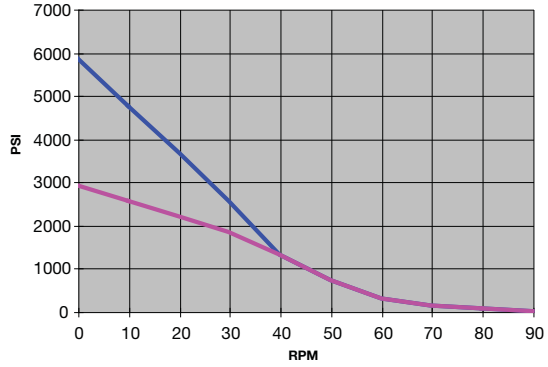
55mm



60mm



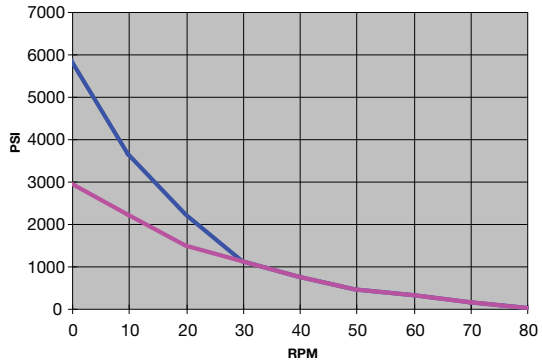
65mm



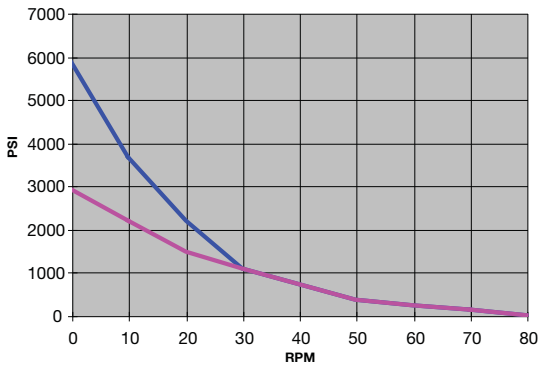
Performance Charts

500 Series - High Pressure

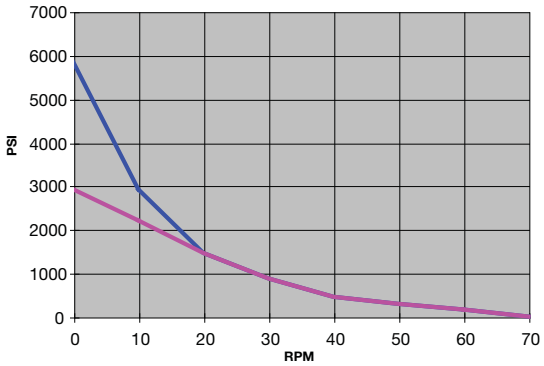
70mm



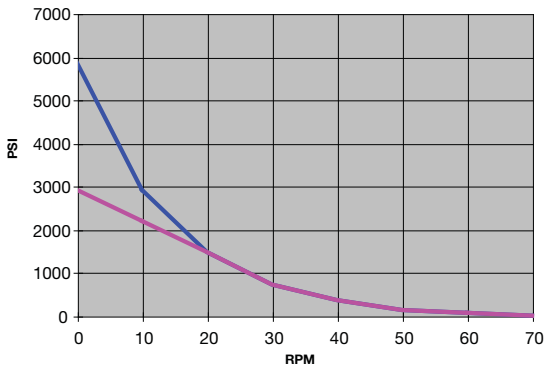
75mm



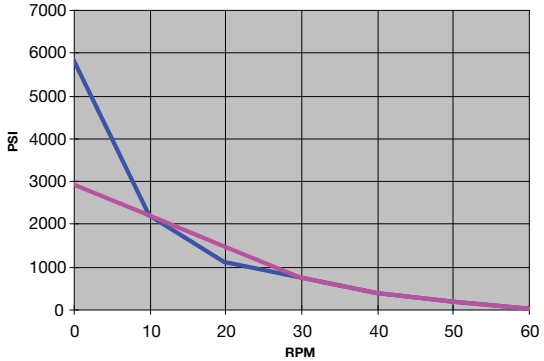
80mm



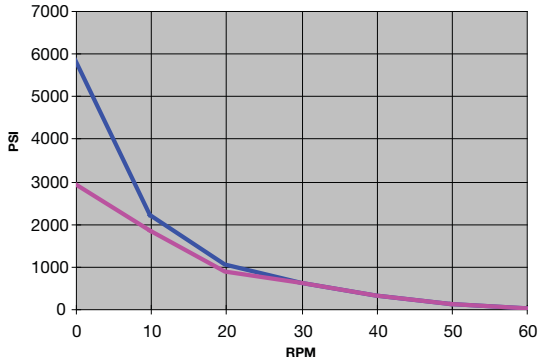
85mm



90mm



95mm



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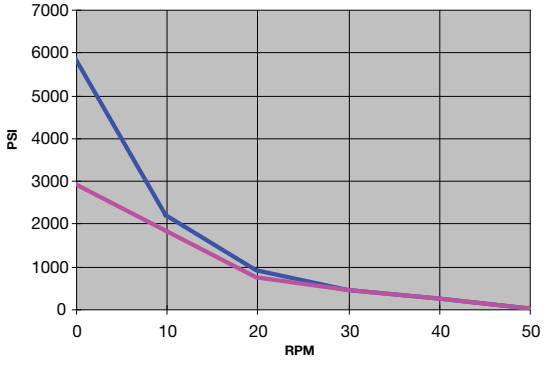


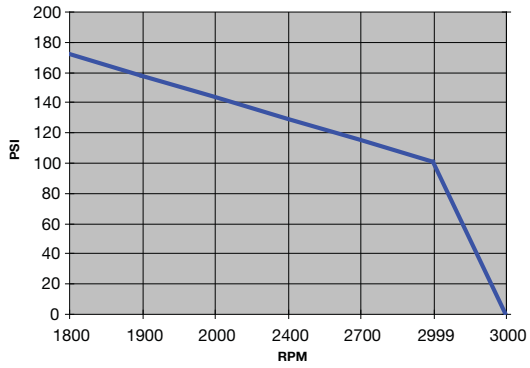
Standard Materials

Stainless Steel

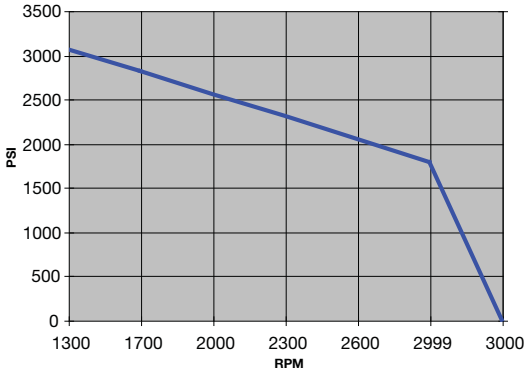
Performance Charts

500 Series - High Speed

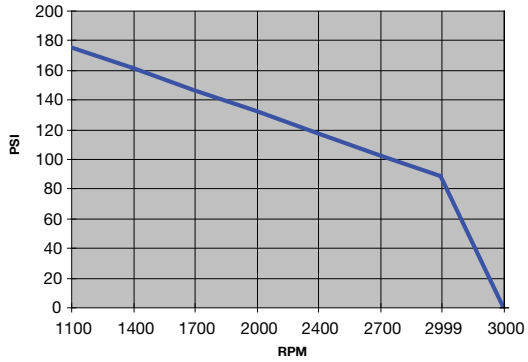
20mm



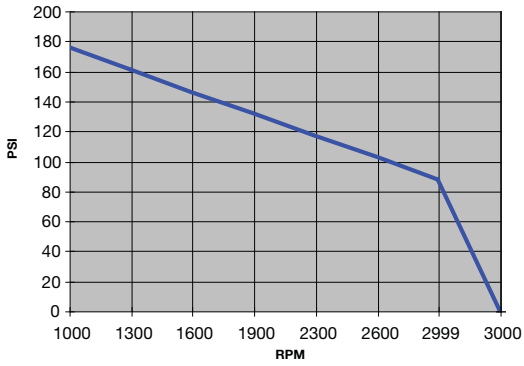
30mm



40mm



45mm



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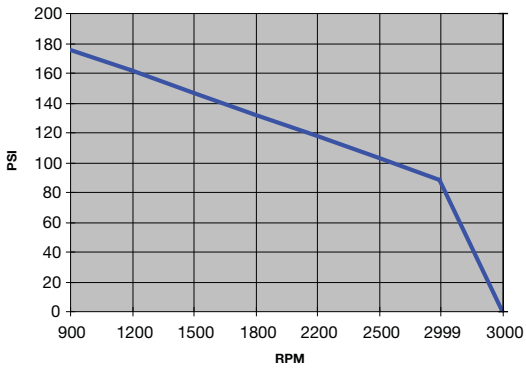

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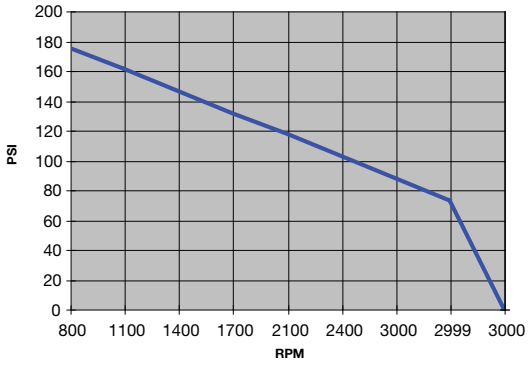
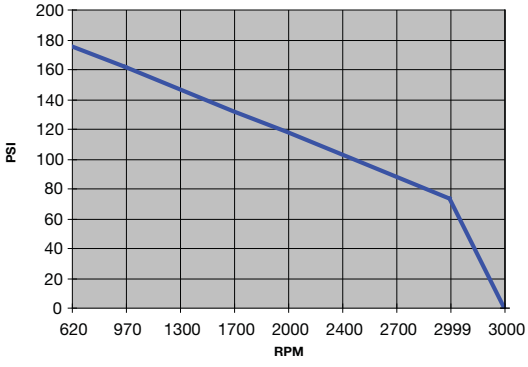
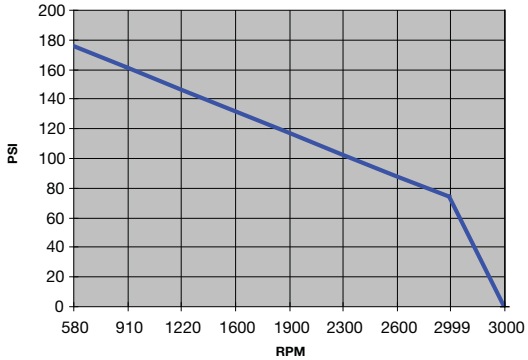


60mm



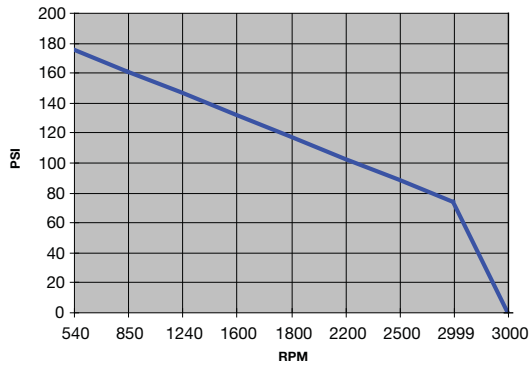
65mm



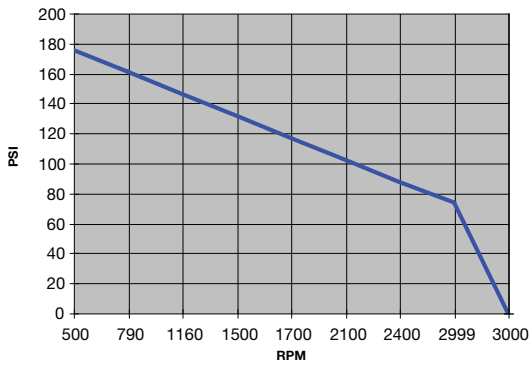
Performance Charts

500 Series - High Speed

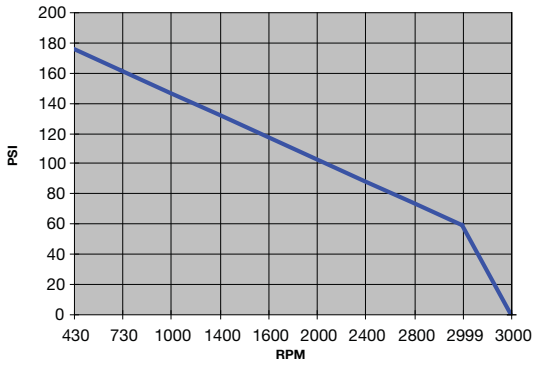
70mm



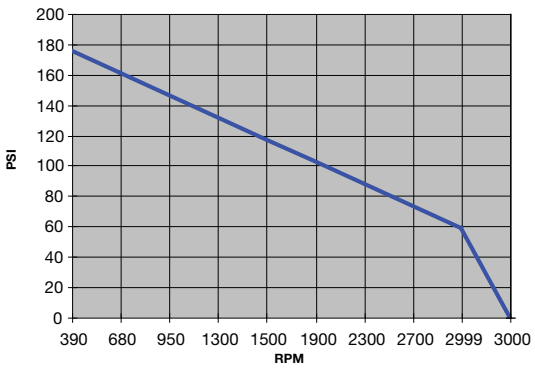
75mm



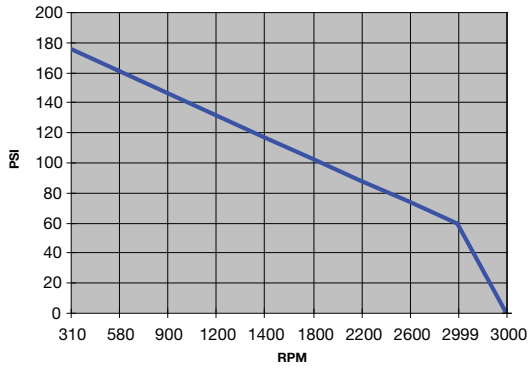
80mm



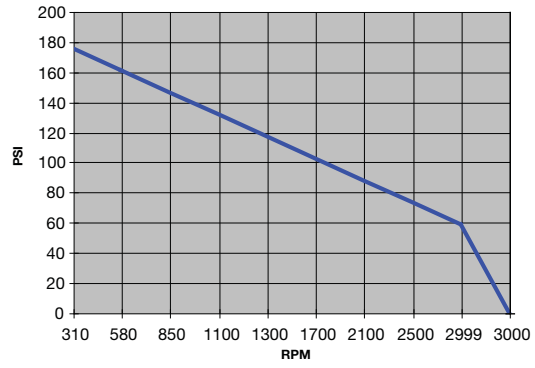
85mm



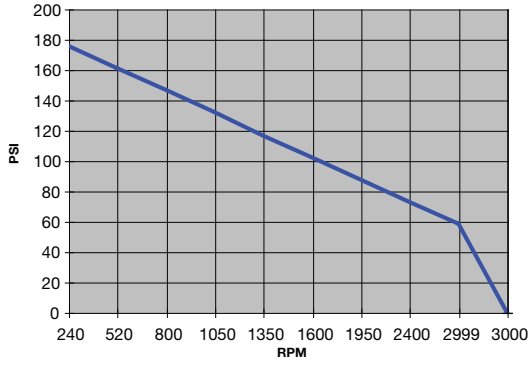
90mm



95mm



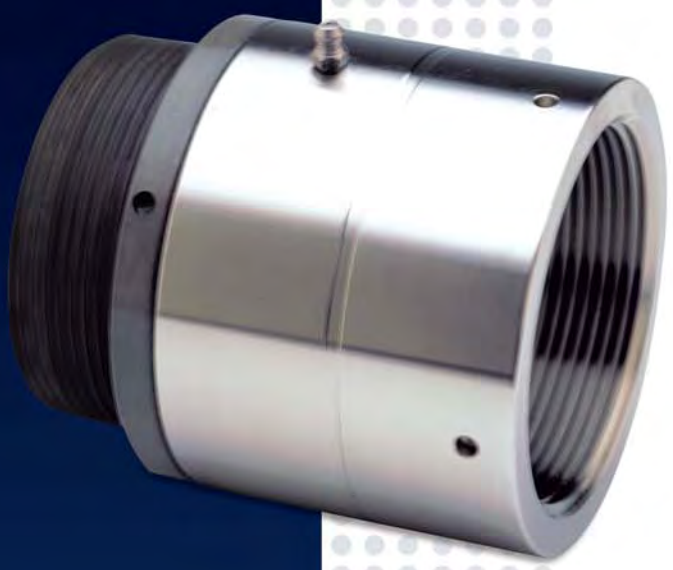
100mm



Standard Materials
& Stainless Steel

1100 SERIES

SLOW ROTATION SWIVEL



Operating Parameters

MEDIA
Water, Air, Hydraulic Fluid

PRESSURE*
725 PSI

TEMPERATURE*
392° F

SPEED*
60 RPM

MATERIAL
Nickel Plated Steel
Also Available In All Stainless Steel

THREADS
- 1/4" to 3" NPT
- BSP Available

** See Performance Charts For Details*

Features & Benefits

Bi-Directional Swivel

1100 Series swivels are for applications where complete rotation is not necessary.

Designed For Slow Rotation

Designed for swiveling or slow rotation applications.

Superior Sealing Performance

The 1100 series has the GR seal for superior sealing performance.

Multiple Configurations

Available with axial (straight through) flow, or radial flow with the addition of a 90° stainless steel elbow.

Corrosion Resistant

Features nickel plated carbon steel construction. Stainless steel models are also available.

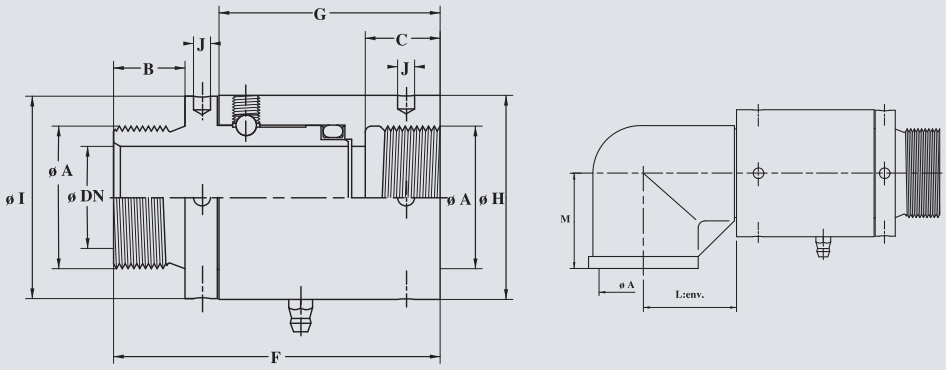
1100 SERIES SWIVELS

PART NUMBERS

Nominal Pipe Size	Shaft Thread (A)	Axial Flow				with Stainless Steel Elbow			
		Nickel Plated Steel		Stainless Steel		Nickel Plated Steel		Stainless Steel	
		Part Number	Description	Part Number	Description	Part Number	Description	Part Number	Description
1/4	1/4	**750839C**	R1013KNPT	**760628C**	R1013INPT	**760934**	R1013KENPT	**760944**	R1013IENPT
3/8	3/8	**750840C**	R1017KNPT	**750850C**	R1017INPT	**760935**	R1017KENPT	**760945**	R1017IENPT
1/2	1/2	**750841C**	R1021KNPT	**750851C**	R1021INPT	**760936**	R1021KENPT	**760946**	R1021IENPT
3/4	3/4	**750842C**	R1027KNPT	**750852C**	R1027INPT	**760937**	R1027KENPT	**760947**	R1027IENPT
1	1	**750843C**	R1034KNPT	**750853C**	R1034INPT	**760938**	R1034KENPT	**760948**	R1034IENPT
1-1/4	1-1/4	**750844C**	R1042KNPT	**750854C**	R1042INPT	**760939**	R1042KENPT	**760949**	R1042IENPT
1-1/2	1-1/2	**750845C**	R1049KNPT	**750855C**	R1049INPT	**760940**	R1049KENPT	**760950**	R1049IENPT
2	2	**750846C**	R1060KNPT	**750856C**	R1060INPT	**760941**	R1060KENPT	**760951**	R1060IENPT
2-1/2	2-1/2	**750847C**	R1076KNPT	**750857C**	R1076INPT	**760942**	R1076KENPT	**760952**	R1076IENPT
3	3	**750848C**	R1090KNPT	**750858C**	R1090INPT	**760943**	R1090KENPT	**760953**	R1090IENPT

MAXIMUM OPERATING PRESSURE (psi)

Nominal Pipe Size	Nickel Plated Steel	Stainless Steel
1/4	725	290
3/8	725	290
1/2	725	290
3/4	725	290
1	435	218
1-1/4	435	218
1-1/2	435	218
2	290	145
2-1/2	290	145
3	290	145



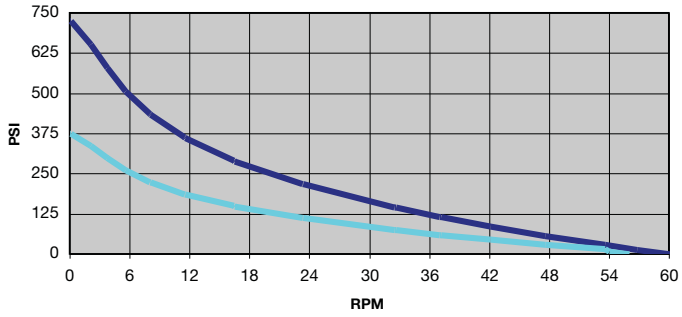
1100 SERIES SWIVEL (in.)

DIMENSIONS

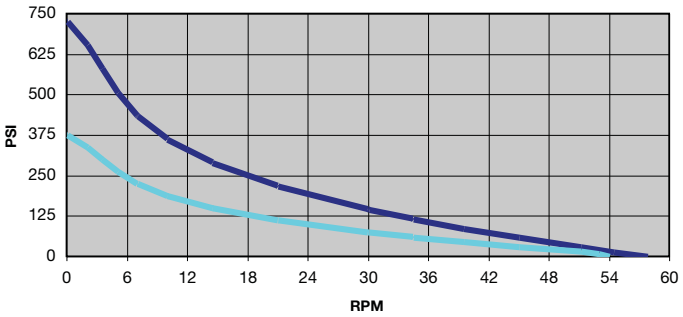
Nominal Pipe Size	Shaft Thread (A)	B	C	DN	Overall Length (F)	G	Overall Diameter (H)	I	J	L	M
1/4	1/4	.39	.43	.27	1.87	1.22	.98	.74	.19	.78	.78
3/8	3/8	.43	.47	.39	2.06	1.37	1.25	1.02	.19	1.10	.94
1/2	1/2	.55	.59	.43	2.30	1.49	1.25	1.02	.19	1.18	1.10
3/4	3/4	.62	.66	.70	2.97	2	1.77	1.49	.23	1.25	1.25
1	1	.74	.78	.98	3.42	2.36	2.04	2.04	.23	1.53	1.49
1-1/4	1-1/4	.82	.86	1.18	3.77	2.55	2.36	2.36	.23	1.73	1.77
1-1/2	1-1/2	.82	.86	1.49	3.85	2.63	2.55	2.55	.23	2.00	1.96
2	2	.98	1.02	1.88	4.48	3.07	3.14	3.14	.27	2.36	2.28
2-1/2	2-1/2	1.10	.90	2.36	4.46	2.95	3.74	3.74	.27	2.95	2.75
3	3	1.18	1.02	2.95	4.78	3.18	4.17	4.17	.27	3.42	3.07

Performance Charts

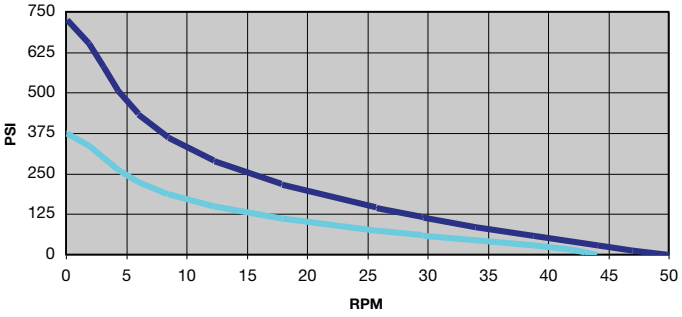
1/4"



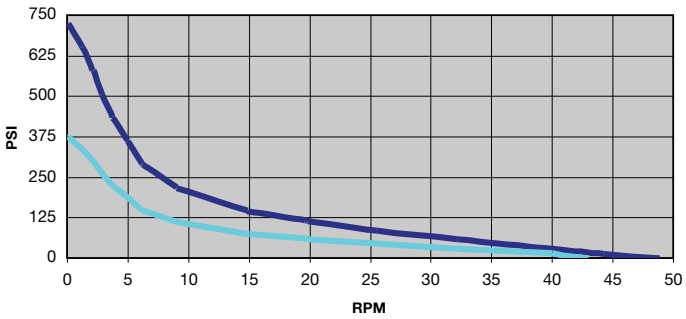
3/8"



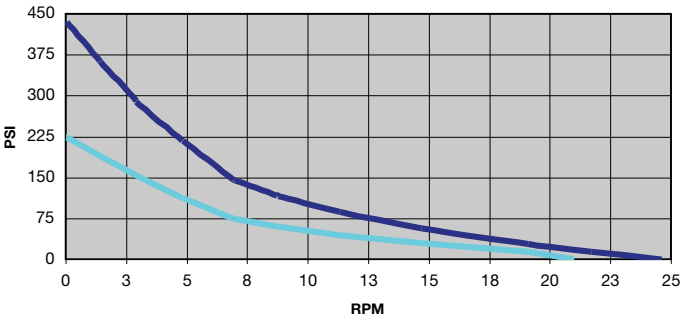
1/2"



3/4"



1"

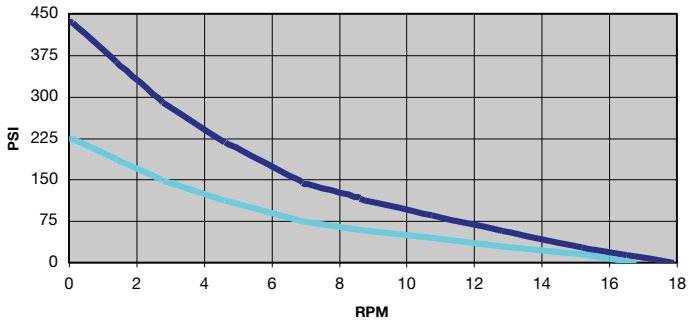


Standard Materials

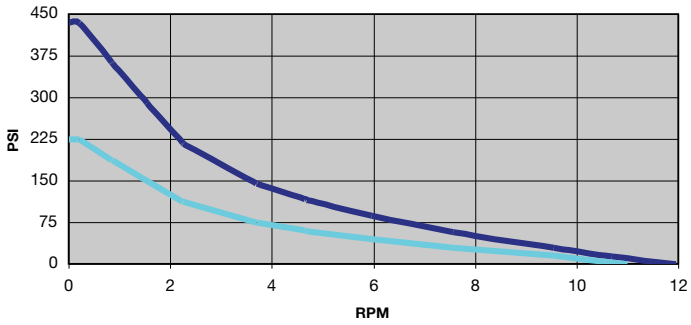
Stainless Steel

Performance Charts

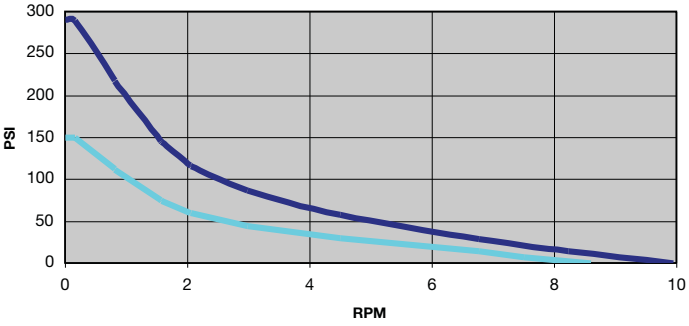
1 1/4"



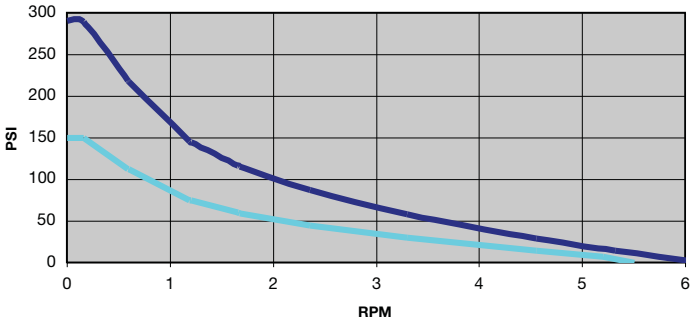
1 1/2"



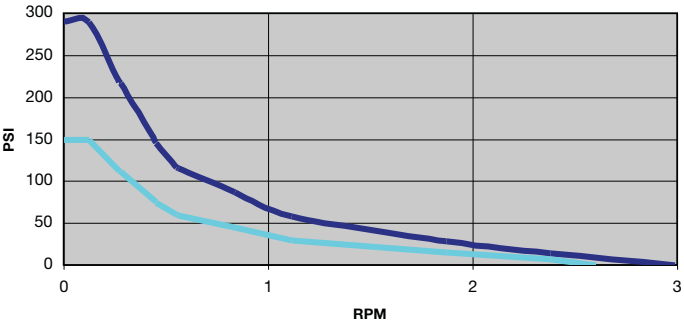
2"



2 1/2"



3"



Standard Materials

Stainless Steel

1102 SERIES

SLOW ROTATION SWIVEL

Operating Parameters

MEDIA

Water, Air, Hydraulic Fluid

PRESSURE*

1,160 PSI

TEMPERATURE*

392° F

SPEED*

90 RPM

THREADS

- 1/4" to 6" NPT
- BSP Available

MATERIAL

Nickel Plated Steel

Also Available In All Stainless Steel

** See Performance Charts For Details*

Features & Benefits

Bi-Directional Swivel

1102 Series swivels are for applications where complete rotation is not necessary.

Slow Rotation Applications

Designed for swiveling or slow rotation applications.

High Pressure

The 1102 will operate at pressures up to 1160 psi.

Superior Sealing Performance

The 1102 series has the GR Seal for superior sealing performance.

Multiple Configurations

Available with axial (straight through) flow, or radial flow with the addition of a 90° stainless steel elbow.

Corrosion Resistant

Features nickel plated carbon steel construction. Stainless steel models are also available.

Stability At Higher Speeds & Pressures

The 1102 Series offers two ball races which allow for increased pressure and speed.

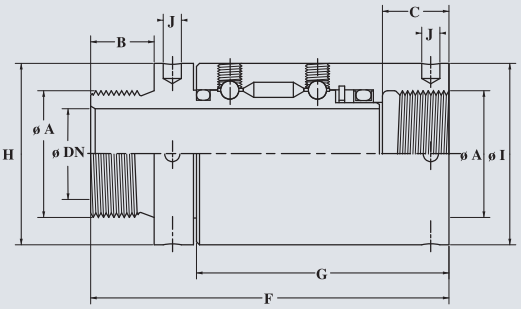
1102 SERIES SWIVELS

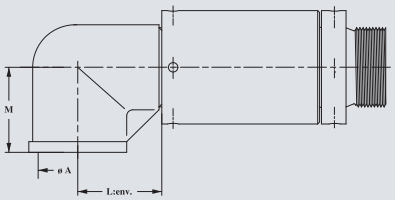
PART NUMBERS

Nominal Pipe Size	Shaft Thread (A)	Axial Flow				with Stainless Steel Elbow			
		Nickel Plated Steel		Stainless Steel		Nickel Plated Steel		Stainless Steel	
		Part Number	Description	Part Number	Description	Part Number	Description	Part Number	Description
1/4	1/4	**750859C**	R1013K2NPT	**750872C**	R1013I2NPT	**760980C**	R1013K2ENPT	**760993C**	R1013I2ENPT
3/8	3/8	**750860C**	R1017K2NPT	**750873C**	R1017I2NPT	**760981C**	R1017K2ENPT	**760994C**	R1017I2ENPT
1/2	1/2	**750861C**	R1021K2NPT	**750874C**	R1021I2NPT	**760982C**	R1021K2ENPT	**760995C**	R1021I2ENPT
3/4	3/4	**750862C**	R1027K2NPT	**750875C**	R1027I2NPT	**760983C**	R1027K2ENPT	**760996C**	R1027I2ENPT
1	1	**750863C**	R1034K2NPT	**750876C**	R1034I2NPT	**760984C**	R1034K2ENPT	**760997C**	R1034I2ENPT
1-1/4	1-1/4	**750864C**	R1042K2NPT	**750877C**	R1042I2NPT	**760985C**	R1042K2ENPT	**760998C**	R1042I2ENPT
1-1/2	1-1/2	**750865C**	R1049K2NPT	**750878C**	R1049I2NPT	**760986C**	R1049K2ENPT	**760999C**	R1049I2ENPT
2	2	**750866C**	R1060K2NPT	**750879C**	R1060I2NPT	**760987C**	R1060K2ENPT	**770000C**	R1060I2ENPT
2-1/2	2-1/2	**750867C**	R1076K2NPT	**750880C**	R1076I2NPT	**760988C**	R1076K2ENPT	**770001C**	R1076I2ENPT
3	3	**750868C**	R1090K2NPT	**750881C**	R1090I2NPT	**760989C**	R1090K2ENPT	**770002C**	R1090I2ENPT
4	4	**750869C**	R10114K2NPT	**750882C**	R10114I2NPT	–	–	–	–
5	5	**750870C**	R10140K2NPT	**750883C**	R10140I2NPT	–	–	–	–
6	6	**750871C**	R10165K2NPT	**750884C**	R10165I2NPT	–	–	–	–

MAXIMUM OPERATING PRESSURE (psi)

Nominal Pipe Size	Nickel Plated Steel	Stainless Steel
1/4	1160	435
3/8	1160	435
1/2	1160	435
3/4	870	360
1	870	360
1-1/4	580	290
1-1/2	580	290
2	435	215
2-1/2	435	215
3	435	215
4	290	145
5	290	145
6	215	115





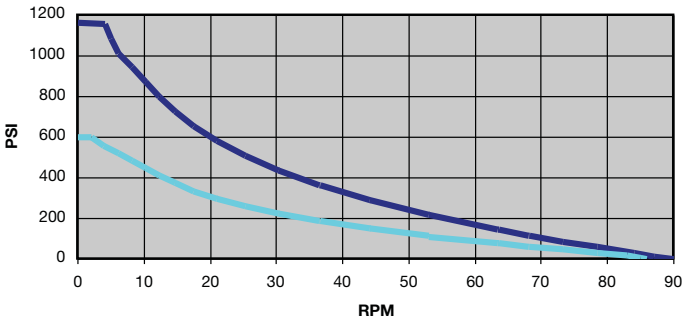
1102 SERIES SWIVEL (in.)

DIMENSIONS

Nominal Pipe Size	Shaft Thread (A)	B	C	DN	F	G	H	I	J	L	M
1/4	1/4	.39	.43	.27	2.48	1.77	.74 (flats)	.98	.19	.78	.78
3/8	3/8	.43	.47	.39	2.83	2.00	1.02 (flats)	1.25	.19	1.10	.94
1/2	1/2	.55	.59	.43	3.07	2.12	1.02 (flats)	1.25	.19	1.18	1.10
3/4	3/4	.62	.66	.70	3.77	2.65	1.49 (flats)	1.77	.23	1.25	1.25
1	1	.74	.78	.98	4.21	2.97	2.04	2.04	.23	1.53	1.49
1-1/4	1-1/4	.82	.86	1.18	4.64	3.28	2.36	2.36	.23	1.73	1.77
1-1/2	1-1/2	.82	.86	1.49	5.15	3.79	2.55	2.55	.23	51	1.96
2	2	.98	1.02	1.88	5.90	4.38	3.14	3.14	.27	2.36	2.28
2-1/2	2-1/2	1.10	1.18	2.36	6.73	5.03	3.74	3.74	.27	2.95	2.75
3	3	1.18	1.25	2.95	7.28	5.51	4.17	4.17	.27	3.42	3.07
4	4	1.37	1.57	3.93	8.00	6.18	5.43	5.43	.27	–	–
5	5	1.37	1.57	4.72	8.00	6.18	6.69	6.69	.27	–	–
6	6	1.37	1.57	5.90	8.00	6.18	7.87	7.87	.27	–	–

Performance Charts

1/4" & 3/8"



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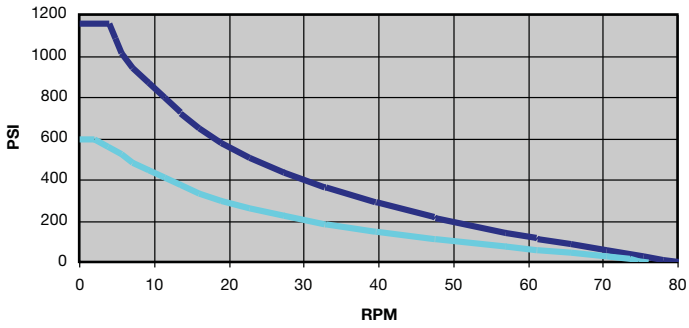

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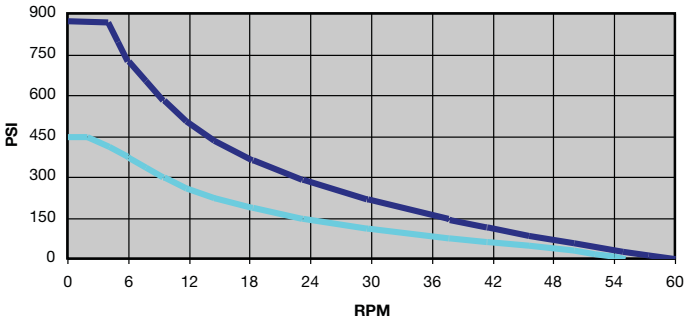

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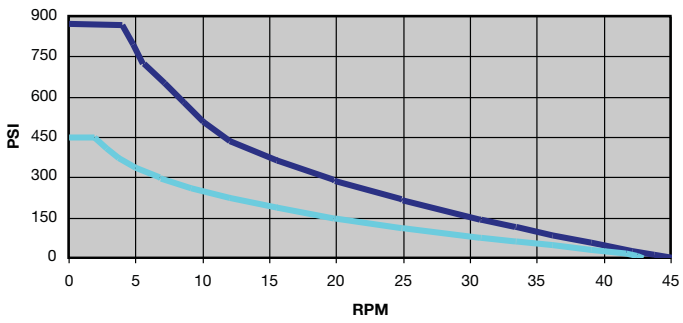

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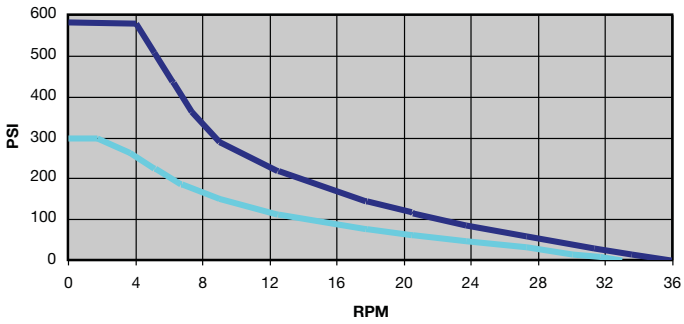

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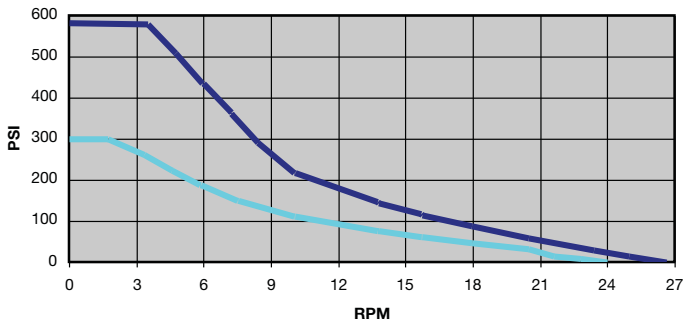
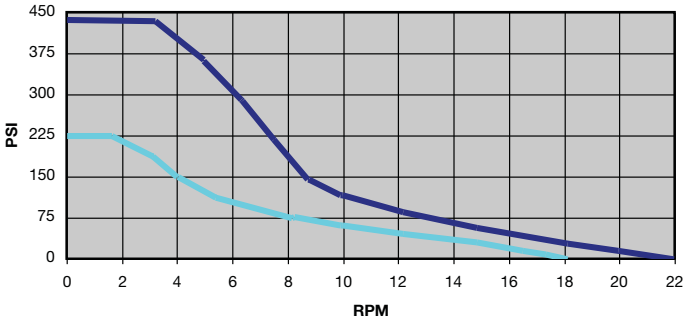


Standard Materials Stainless Steel

Performance Charts

2"



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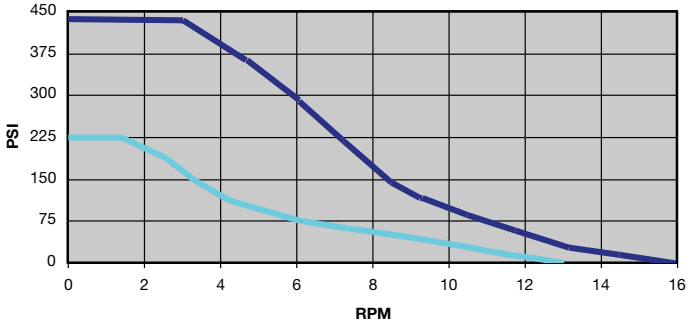

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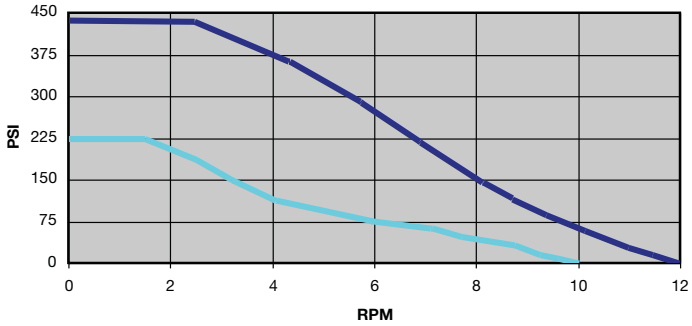

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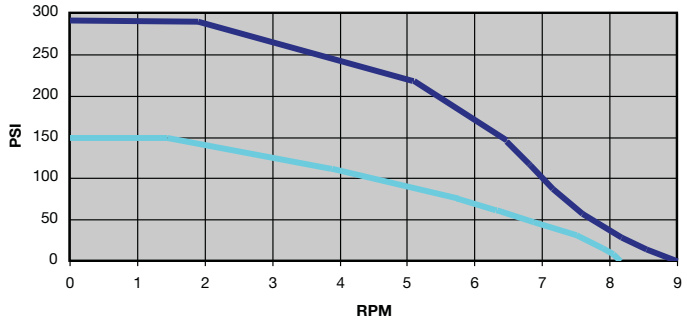

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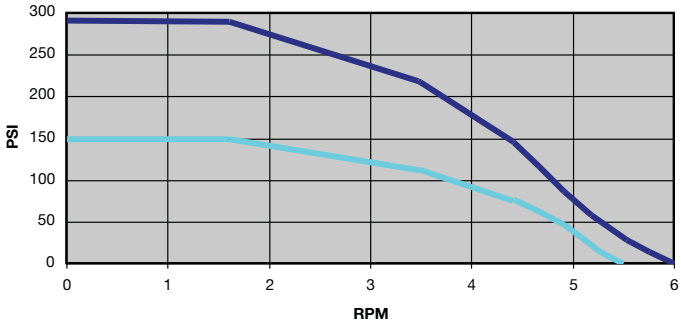
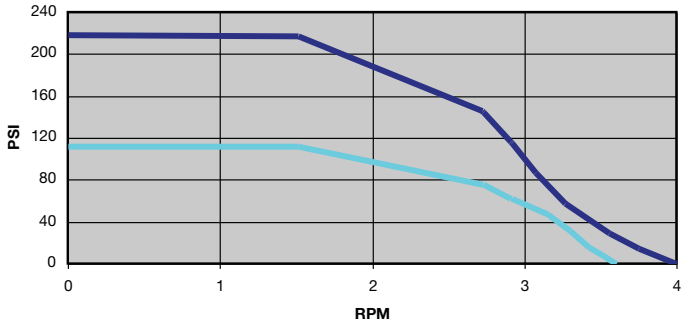


6"



Standard Materials Stainless Steel

1200 SERIES

SMALL ENVELOPE SWIVEL

Operating Parameters

MEDIA	PRESSURE
Water, Air, Hydraulic Fluid	5,075 PSI
TEMPERATURE	**SPEED**
392° F	Swivel
MATERIAL	**THREADS**
Nickel Plated Steel	■ 1/4" to 2" NPT ■ Other Threads Available

Features & Benefits

Small Profile
Perfect for small envelope dimensions.

Bi-Directional Swivel
Slow or swiveling rotation.

Hydraulic Applications
Suitable for hydraulic service.

No Lubrication
PTFE seals require no lubrication.

Easy Installation
Precision made wrench flats on center shaft for easy installation. Custom designs available.

Corrosion Resistant
The 1200 Series is nickel plated as standard. Also available in stainless steel.

Thread Connections
NPT standard. SAE, JIC, DIN or ISO threads are available upon request.

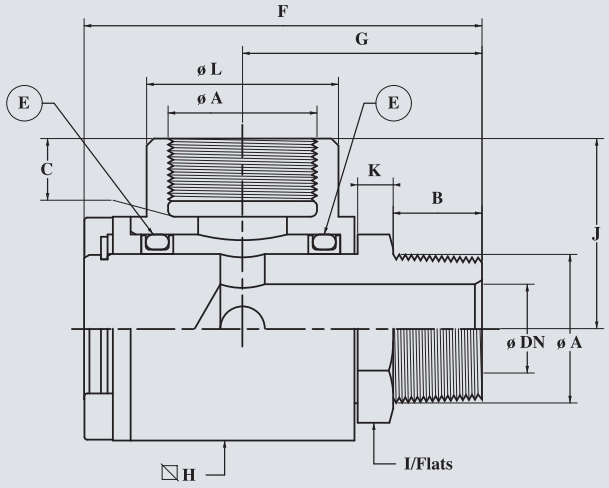
1200 SERIES SWIVELS

PART NUMBERS

Nominal Pipe Size	Nickel Plated Steel				Stainless Steel			
	Right Hand Thread		Left Hand Thread		Right Hand Thread		Left Hand Thread	
	Part Number	Description	Part Number	Description	Part Number	Description	Part Number	Description
1/4	**750981C**	R1213SR2KNPT	**760645C**	L1213SR2KNPT	**750988C**	R1213SR2INPT	**760653C**	L1213SR2INPT
3/8	**750982C**	R1217SR2KNPT	**760646C**	L1217SR2KNPT	**750989C**	R1217SR2INPT	**760654C**	L1217SR2INPT
1/2	**750983C**	R1221SR2KNPT	**760647C**	L1221SR2KNPT	**750990C**	R1221SR2INPT	**760655C**	L1221SR2INPT
3/4	**750984C**	R1227SR2KNPT	**760648C**	L1227SR2KNPT	**750991C**	R1227SR2INPT	**760656C**	L1227SR2INPT
1	**750985C**	R1234SR2KNPT	**760649C**	L1234SR2KNPT	**750992C**	R1234SR2INPT	**760657C**	L1234SR2INPT
1-1/4	**750986C**	R1242SR2KNPT	**760650C**	L1242SR2KNPT	**750993C**	R1242SR2INPT	**760658C**	L1242SR2INPT
1-1/2	**750987C**	R1249SR2KNPT	**760651C**	L1249SR2KNPT	**750994C**	R1249SR2INPT	**760659C**	L1249SR2INPT

MAXIMUM OPERATING PRESSURE (psi)

Nominal Pipe Size	Nickel Plated Steel	Stainless Steel
1/4	5,075	2,530
3/8	5,075	2,530
1/2	4,350	2,175
3/4	4,350	2,175
1	3,625	1,810
1-1/4	3,625	1,810
1-1/2	2,900	1,450
2	2,900	1,450



1200 SERIES SWIVEL (in.)

DIMENSIONS

Nominal Pipe Size	Shaft Thread (A)	B	C	DN	E*	F	G	H	I (flats)	J	K	L
1/4	1/4	.55	.47	.27	GR817SR	2.24	1.33	1.10	.82	1.02	.23	1.02
3/8	3/8	.59	.55	.39	GR821SR	2.5	1.53	1.25	.90	1.18	.29	1.18
1/2	1/2	.70	.59	.51	GR827SR	3.07	1.81	1.57	1.18	1.37	.31	1.49
3/4	3/4	.86	.78	.70	GR834SR	3.60	2.18	1.96	1.65	1.77	.33	1.77
1	1	.98	.86	.94	GR849SR	4.40	2.63	2.48	1.81	2.10	.39	2.15
1-1/4	1-1/4	1.18	1.22	1.18	GR849SR	5.39	3.12	3.11	2.12	2.63	.37	2.75
1-1/2	1-1/2	1.18	1.18	1.49	GR860SR	6.25	3.62	3.77	2.75	3.03	.47	3.74

* 2 Seals Per Joint

1300 SERIES

FLANGED SWIVEL

Operating Parameters

MEDIA	PRESSURE *
Water, Air	290 PSI
TEMPERATURE *	**SPEED ***
392° F	Swivel
MATERIAL	**CONNECTION TYPE**
Nickel Plated Steel	2” to 12” Flange

** See Performance Charts For Details*

Features & Benefits

Swivel Applications

Used in applications where slow rotation or swiveling motion is needed.

GR Seal Technology

Design features include a ball bearing for rotation, and a GR seal for superior sealing performance.

Flanged Swivel Design

Allows for stability in high flow applications.

High Temperature Applications

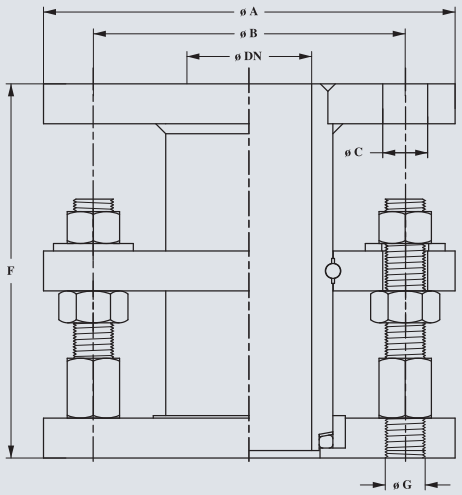
Can be used in applications with temperatures up to 392° F.

PART NUMBERS

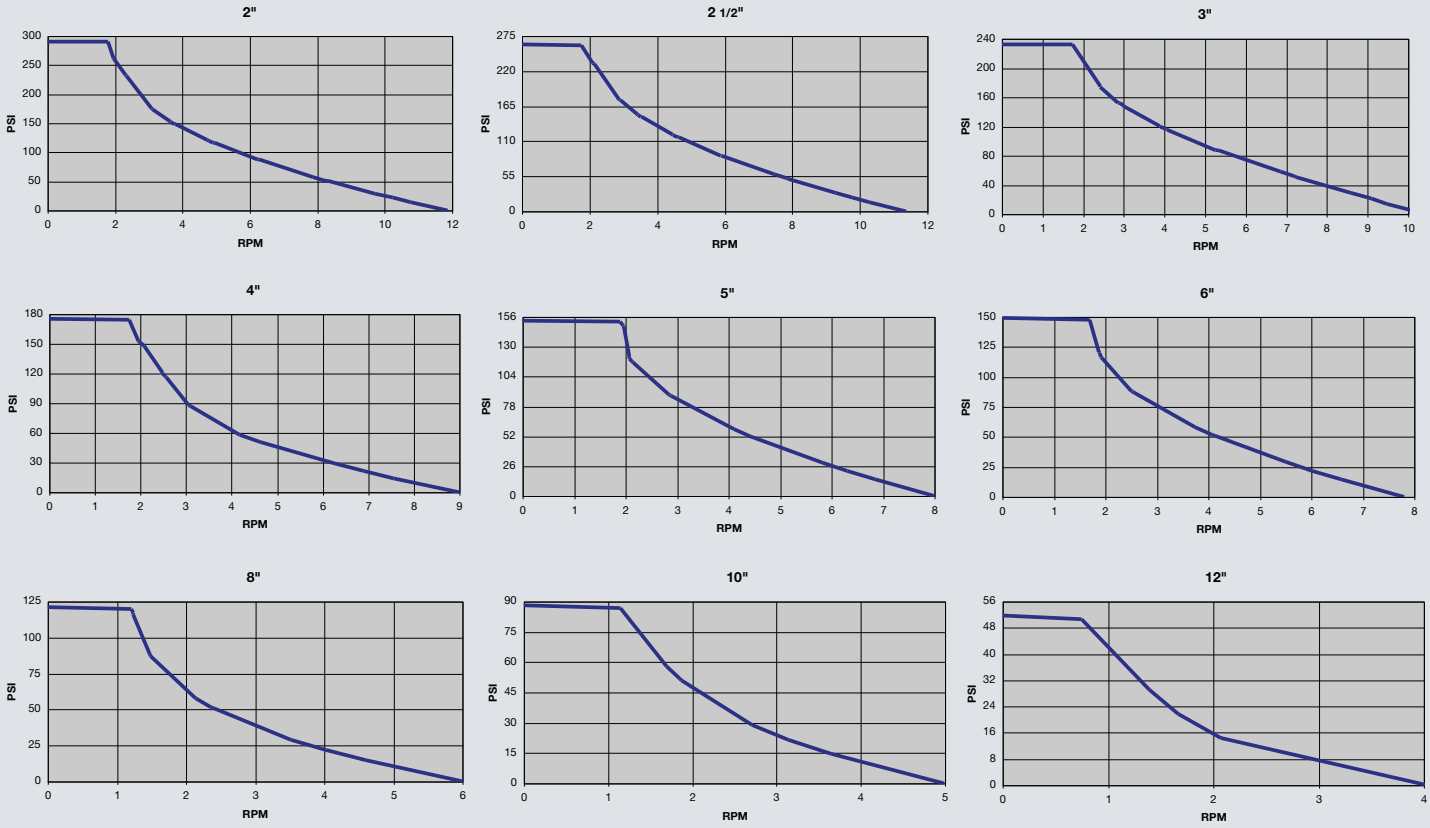
1300 SERIES FLANGED SWIVELS

Nominal Pipe Size	Nickel Plated Steel		Stainless Steel	
	Part Number	Description	Part Number	Description
2	**760572C**	BR50K	**760582C**	BR50I
2-1/2	**760573C**	BR66K	**760583C**	BR66I
3	**760574C**	BR80K	**760584C**	BR80I
4	**760575C**	BR100K	**760585C**	BR100I
5	**760576C**	BR125K	**760586C**	BR125I
6	**760577C**	BR150K	**760587C**	BR150I
8	**760579C**	BR200K	**760589C**	BR200I
10	**760580C**	BR250K	**760590C**	BR250I
12	**760581C**	BR300K	**760591C**	BR300I

1300 SERIES FLANGED SWIVEL (in.)								
DIMENSIONS	Nominal Pipe Size	Number of Holes	Overall Diameter (A)	B	Slot C	DN	Overall Length (F)	Thread (G)
	2	4	6.49	4.92	.70	2	5.90	4 x .70
	2-1/2	4	7.28	5.70	.70	2-1/2	5.90	4 x .70
	3	8	7.87	6.29	.70	3	5.90	4 x .70 4 x M16
	4	8	8.66	7.08	.70	4	5.90	8 x .70
	5	8	9.84	8.26	.70	5	5.90	8 x .70
	6	8	11.22	9.44	.86	6	5.90	8 x .86
	8	8	13.38	11.60	.86	8	7.87	8 x .86
	10	12	15.55	13.77	.86	10	7.87	12 x .86
	12	12	17.50	15.70	.86	12	7.87	12 x .86



Performance Charts



1700 SERIES

HIGH PRESSURE SWIVEL

Operating Parameters

MEDIA
Water, Air, Hydraulic Fluid

PRESSURE*
5,075 PSI

TEMPERATURE*
248° F

SPEED*
80 RPM

MATERIAL
Nickel Plated Steel

THREADS
- 1/4" to 3" NPT
- BSP & BSPP Available

** See Performance Charts For Details*

Features & Benefits

High Pressure Applications
High pressure swivel for use in hydraulic and pneumatic applications.

Corrosion Resistant
Standard models feature nickel treated carbon steel construction, but are also available in all stainless steel.

GR Seal Technology
Equipped with a GR seal, which is suitable for most fluids.

Thrust Bearings
A single acting thrust bearing permits slow rotation at high pressures.

PART NUMBERS

1700 SERIES HIGH PRESSURE SWIVEL

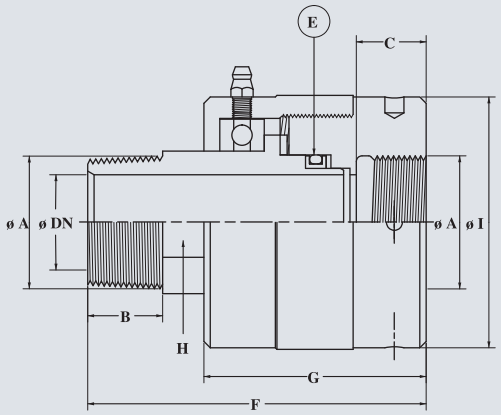
Nominal Pipe Size (DN)	Shaft Thread (A)	Part Number	Description
1/4"	1/4"	**750788C**	R1813SRKNPT
3/8"	3/8"	**750789C**	R1817SRKNPT
1/2"	1/2"	**750790C**	R1821SRKNPT
3/4"	3/4"	**750791C**	R1827SRKNPT
1"	1"	**750792C**	R1834SRKNPT
1-1/8"	1-1/4"	**750793C**	R1842SRKNPT
1-1/2"	1-1/2"	**750794C**	R1849SRKNPT
1-3/4"	2"	**750795C**	R1860SRKNPT
2-1/4"	2-1/2"	**750796C**	R1876SRKNPT
2-3/4"	3"	**750797C**	R1890SRKNPT

MAXIMUM OPERATING PRESSURE (psi)

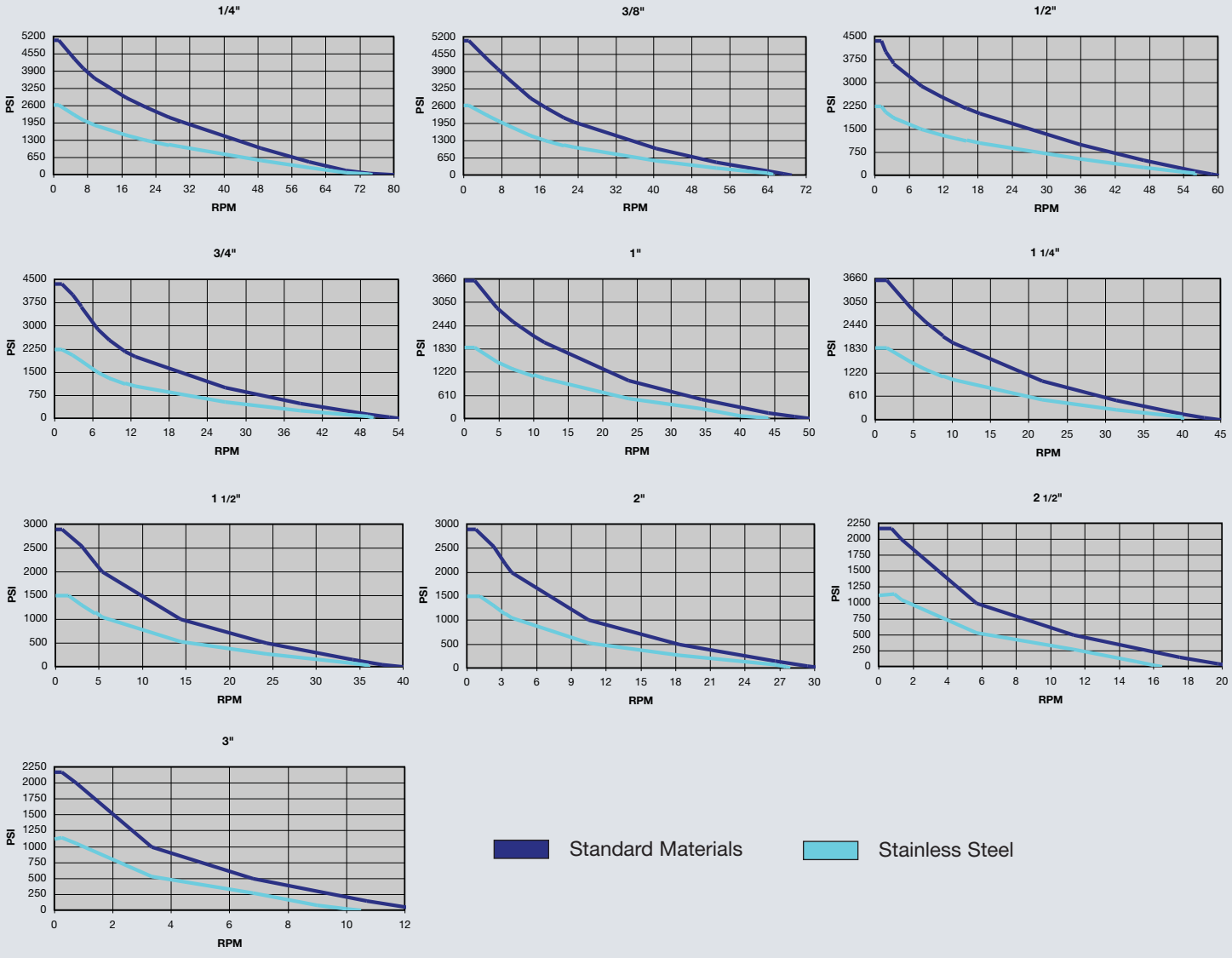
Nominal Pipe Size (DN)	Shaft Thread (A)	Maximum Pressure (PSI)
1/4	1/4	5,075
3/8	3/8	5,075
1/2	1/2	4,350
3/4	3/4	4,350
1	1	3,625
1-1/8	1-1/4	3,625
1-1/2	1-1/2	2,900
1-3/4	2	2,900
2-1/4	2-1/2	2,175
2-3/4	3	2,175

DIMENSIONS

1700 SERIES HIGH PRESSURE SWIVEL (in.)							
Nominal Pipe Size (DN)	Shaft Thread (A)	B	C	Overall Length (F)	G	Flats (H)	Overall Diameter (I)
1/4	1/4	1/2	7/16	2-5/8	1-3/4	1/2	1-1/4
3/8	3/8	1/2	1/2	2-3/4	1-15/16	1/2	1-1/2
1/2	1/2	5/8	9/16	3-1/8	2-3/16	3/4	2-1/16
3/4	3/4	3/4	5/8	3-1/2	2-1/2	1	2-1/4
1	1	7/8	3/4	3-3/4	2-9/16	1-1/4	2-1/2
1-1/8	1-1/4	1	3/4	4-1/8	2-3/4	1-1/2	3
1-1/2	1-1/2	1	3/4	4-9/16	3-1/8	1-3/4	3-3/8
1-3/4	2	1-1/8	1	4-13/16	3-1/4	2-1/4	4
2-1/4	2-1/2	1-1/8	1	5-1/2	3-3/4	2-3/4	5-1/8
2-3/4	3	1-1/4	1-1/8	7-1/8	4-13/16	3-3/8	6-1/8



Performance Charts



1900 SERIES

HIGH PRESSURE SWIVEL

Operating Parameters

MEDIA	PRESSURE*
Water, Air, Hydraulic Fluid	10,150 PSI
TEMPERATURE*	**SPEED***
248° F	100 RPM
MATERIAL	**THREADS**
Nickel Plated Steel	1/4" to 3" NPT

** See Performance Charts For Details*

Features & Benefits

Hydraulic Applications

High pressure swivel for use in hydraulic and pneumatic applications.

High Pressure

Designed for use in very high pressure applications up to 10,150 psi.

Corrosion Resistant

Standard models feature nickel plated carbon steel construction. Also available in all stainless steel.

GR Seal Technology

Equipped with a GR seal for superior sealing performance.

Stability At High Pressures

Equipped with a double acting thrust bearing and a bronze bushing. The bearing permits higher pressure, while the bushing increases the guide of the shaft to allow faster rotating speeds.

PART NUMBERS

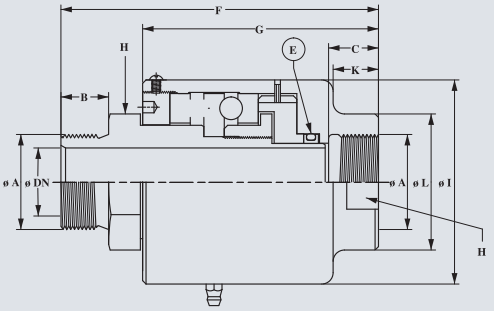
1900 SERIES SWIVEL		
Shaft Thread (A)	Part Number	Description
1/4	**750798C**	R1813SRDENPT
3/8	**750799C**	R1817SRDENPT
1/2	**750800C**	R1821SRDENPT
3/4	**750801C**	R1827SRDENPT
1	**750802C**	R1834SRDENPT
1-1/4	**750803C**	R1842SRDENPT
1-1/2	**750804C**	R1849SRDENPT
2	**750806C**	R1860SRDENPT
2-1/2	**750807C**	R1876SRDENPT
3	**750805C**	R1890SRDENPT

MAX. OPERATING PRESSURE (psi)	
Shaft Thread (A)	Maximum Pressure (PSI)
1/4	10,150
3/8	10,150
1/2	8,700
3/4	7,250
1	7,250
1-1/4	7,250
1-1/2	5,800
2	5,800
2-1/2	5,800
3	5,800

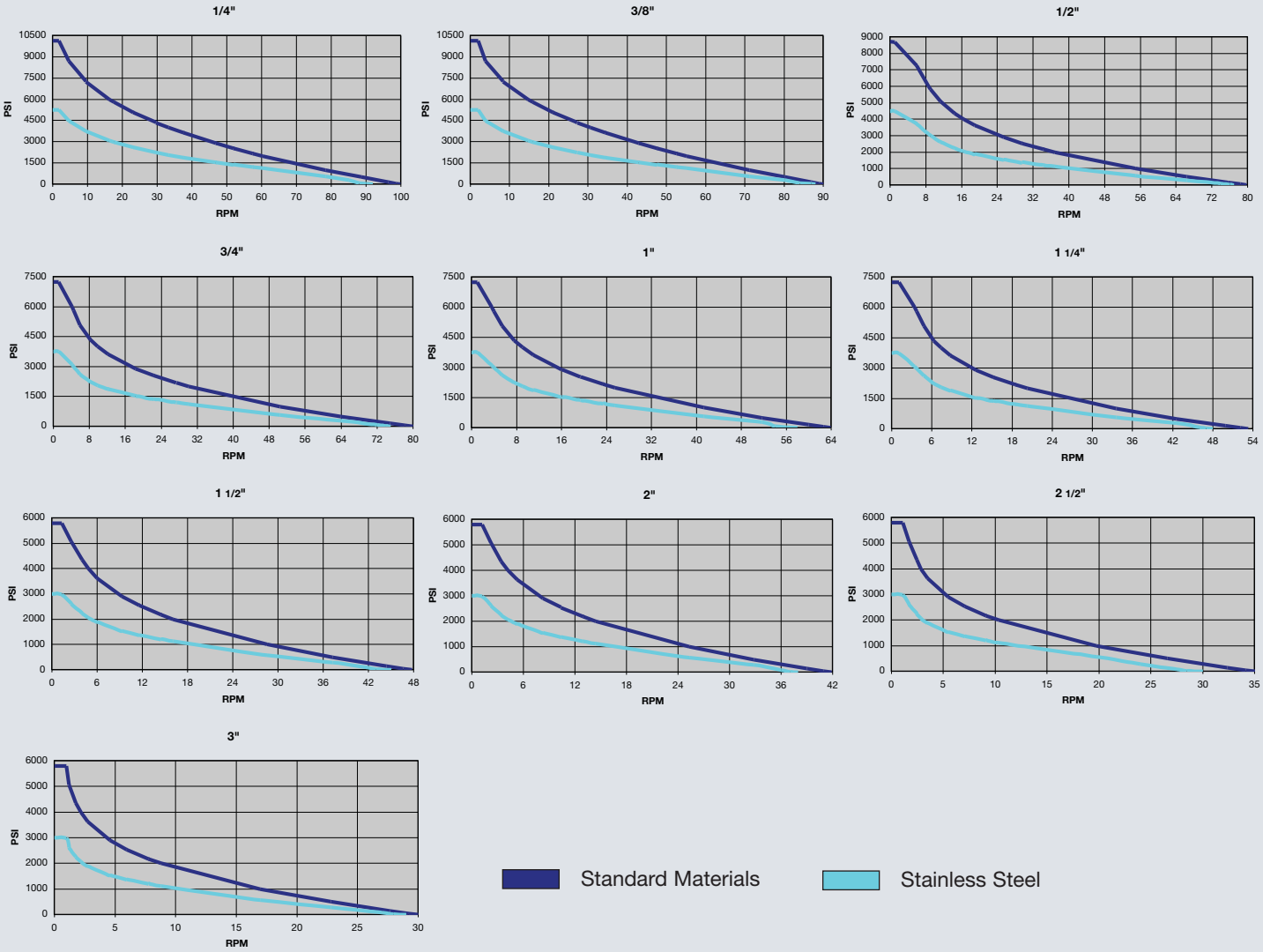
DIMENSIONS

1900 SERIES SWIVEL (in.)

Shaft Thread (A)	B	C	DN	Overall Length (F)	G	Flats (H)	Overall Diameter (I)	K	L
1/4	3/8	7/16	1/4	3-5/8	2-15/16	13/16	1-15/16	5/8	15/16
3/8	7/16	9/16	3/8	4	3-1/8	1-1/4	2-1/8	1/2	1-7/16
1/2	9/16	5/8	1/2	4-1/8	3-1/8	1-1/4	2-1/8	5/8	1-3/8
3/4	5/8	9/16	3/4	4-3/4	3-1/2	1-5/16	2-1/2	3/4	1-1/2
1	3/4	3/4	13/16	5-1/4	4	2	3-5/16	3/4	2-1/8
1-1/4	13/16	13/16	1-1/8	5-1/2	4-1/8	2-1/8	3-1/2	3/4	2-3/8
1-1/2	13/16	13/16	1-7/16	6	4-5/8	2-3/8	4-1/16	1	2-5/8
2	1	1	1-5/8	6-7/16	4-7/8	2-5/8	4-1/2	1	2-15/16
2-1/2	1-1/16	1-1/8	2	7-1/2	5-3/4	4	6	1-1/8	4-1/4
3	1-1/8	1-1/4	2-1/2	8-1/4	6-7/16	4-3/4	6-13/16	1-1/8	5-1/8

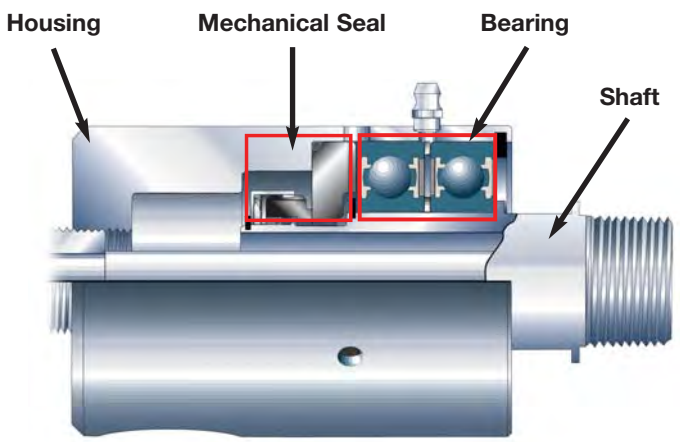


Performance Charts



Rotary Union Design

While rotating joints come in many shapes, sizes, and configurations, they always have the same four basic components: housing, a shaft, a bearing *(or bearings)* and a seal.



Mechanical Seal

The heart of the Rotary Union or rotary joint is the seal. The seal prevents the medium (water, oil, air, etc) from leaking outside the Rotary Union while the Rotary Union is in operation. Duff-Norton uses four basic types of mechanical seals in its Rotary Unions: **1)** pusher-type end face mechanical seal, **2)** non-pusher type end face mechanical seal, **3)** lip seals and **4)** o-ring seal. Rotary Unions may have more than one seal.

Bearing

The second most important part of the Rotary Union is the bearing. A Rotary Union may have only one bearing or multiple bearings. Roller bearings, such as ball bearings and tapered roller bearings, or non-roller bearings, like graphite bearings and bronze bushings, may be used in the Rotary Union. The bearings are always used to allow a part of the joint, either the shaft or the housing, to rotate.

Shaft

The shaft is the component that carries the medium through the Rotary Union into the drum or roll. In many cases, the shaft will turn with the drum or roll. In some cases, like in larger flanged rotary Unions, the shaft may be stationary while the housing rotates. The bearings and seal are typically assembled around the shaft.

Housing

The housing is the component that holds all of the other elements of the Rotary Union together. The housing has an inlet port, which is a threaded port to which the hose supplying the medium will be attached *(See the next page for recommended hose installation)*. The Rotary Union may also have an outlet port, if the same joint is being used both to supply fluid to a roll and to remove fluid from the roll. In smaller Rotary Unions, the housing is stationary. In larger Rotary Unions, the housing maybe bolted to the drum or roll using a flange. In these cases, the housing rotates at the same speed as the drum.

Rotary Union Technical Data

SINGLE FLOW - P		
Size	Free Flow Area (Sq. In.)	Cv
1/4"	0.050	2.06
3/8"	0.111	2.95
1/2"	0.196	5.25
3/4"	0.442	11.8
1"	0.785	21
1 1/4"	1.227	33
1 1/2"	1.767	47
2"	3.14	84
2 1/2"	4.43	113
3"	6.49	173
4"	12.57	335
5"	19.60	523

$GRM = C_v\sqrt{\triangle P}$

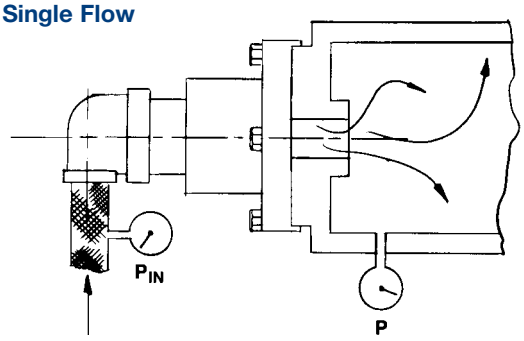
Where:

GPM = Flow rate in gallons per minute of water

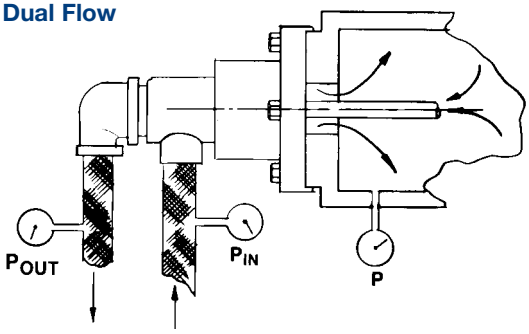
C_v = Flow factor in gallons of water flow per minute with a 1 psi pressure drop

$\triangle P$ = Pressure drop, psi

Single Flow



Dual Flow



DUAL FLOW - S, CS, FS, RSP & FRSP						
Size (in.)	Siphon Size	Shaft Area	Cv In	Siphon Area	Cv Out	Cv In and Out
1/4" *	1/8 Tube	0.065	1.6	0.004	0.11	0.1
	3/16 Tube	0.049	1.2	0.012	0.35	0.34
	1/4 Tube	0.028	0.7	0.025	0.73	0.5
3/8" *	1/8 Tube	0.099	2.5	0.004	0.11	0.11
	3/16 Tube	0.083	2.1	0.012	0.35	0.34
	1/4 Tube	0.062	1.6	0.025	0.73	0.67
1/2"	1/4 Tube	0.147	3.8	0.025	0.73	0.72
	1/8 Pipe	0.068	1.7	0.057	1.6	1.16
3/4"	1/8 Pipe	0.312	8.1	0.057	1.6	1.57
	1/4 Pipe	0.212	5.5	0.104	3	2.64
	3/8 Pipe	0.083	2.1	0.191	5.6	1.97
1"	1/8 Pipe	0.656	17	0.057	1.6	1.59
	1/4 Pipe	0.556	14	0.104	3	2.94
	3/8 Pipe	0.427	11	0.191	5.6	5
	1/2 Pipe	0.231	6	0.304	8.9	5
1 1/4"	1/8 Pipe	1.098	28	0.057	1.6	1.6
	1/4 Pipe	0.998	26	0.104	3	2.97
	3/8 Pipe	0.869	22	0.191	5.6	5.43
	1/2 Pipe	0.673	17	0.304	8.9	7.88
	3/4 Pipe	0.361	9.4	0.533	15	8
1 1/2"	1/4 Pipe	1.538	40	0.104	2	2
	3/8 Pipe	1.409	36	0.191	5.6	5.53
	1/2 Pipe	1.213	31	0.304	9	8.6
	3/4 Pipe	0.901	23	0.533	15	12.5
	1 Pipe	0.409	10	0.864	23	9.2
2"	3/8 Pipe	2.784	72	1.495	5.6	5.7
	1/2 Pipe	2.588	67	0.304	9	8.95
	3/4 Pipe	2.276	59	0.533	15	14.7
	1 Pipe	1.784	46	0.864	23	20.8
	1-1/4 Pipe	0.978	25	1.495	44	21.8
2 1/2"	1/2 Pipe	3.876	100	2.036	8.9	8.9
	3/4 Pipe	3.564	92	3.355	15	14.8
	1 Pipe	3.072	80	0.304	23	22.2
	1-1/4 Pipe	2.266	59	0.533	44	35.2
	1-1/2 Pipe	1.595	41	0.864	60	33.9
2 1/2" **	2 Pipe	0.478	12	1.495	98	11.8
3"	1/2 Pipe	5.937	154	2.036	8.9	8.9
	3/4 Pipe	5.625	146	3.355	15	14.9
	1 Pipe	5.133	133	4.788	23	23
	1-1/4 Pipe	4.327	112	1.495	44	40.7
	1-1/2 Pipe	4.106	107	2.036	59	52
	2 Pipe	2.061	53	3.355	98	46.7
3" **	2-1/2 Pipe	0.576	15	4.788	140	14
4" **	1-1/4 Pipe	10.402	270	1.495	44	43.4
	1-1/2 Pipe	9.731	254	2.036	59	58
	2 Pipe	8.136	212	3.355	98	89
	2-1/2 Pipe	6.074	158	4.788	140	105
	3 Pipe	2.945	76	7.393	216	71.7
5" **	1-1/4 Pipe	17.471	450	1.495	44	43.7
	1-1/2 Pipe	16.8	430	2.036	60	59.8
	2 Pipe	15.205	390	3.355	98	95.1
	2-1/2 Pipe	13.143	340	4.788	140	129
	3 Pipe	10.014	260	7.393	216	166

Recommended Hose Installation

Flexible hose must be used to connect each Rotary Union® to its supply or drain piping. Use braided metal hose for all applications involving hot fluids, such as hot water, hot oil or steam. Use two-ply rubber hose for cooling water, refrigerants, air and vacuum service.

Allow for an offset between the Rotary Union joint and the rigid pipe as shown in Exhibit C. It is important to allow a slight curve in the hose to allow the hose to "float". This will prevent a side load from being placed on the Rotary Union. A side load will greatly reduce the life of the Rotary Union.

Rotary Union Thread Size (in.)	Hose Size and Length (in.)	Dimensions (in.)	
		A	B
1/2"	1/2 x 10	2 5/8	1
3/4"	3/4 x 10	2 1/2	11 7/8
1"	1 x 14	3 1/4	14 1/4
1 1/4"	1 1/4 x 16	3 1/2	16 1/4
1 1/2"	1 1/2 x 18	3 3/4	18 1/2
2"	2 x 21	4 3/8	21 3/4
2 1/2"	2 x 21	4 3/8	21 3/4
	2 1/2 x 24	4 1/4	24 3/4
3"	2 1/2 x 24	4 1/4	24 3/4
	3 x 26	4 1/2	28 5/8
3 1/2"	3 x 26	8	28 3/8
4"	4 x 26	8	2

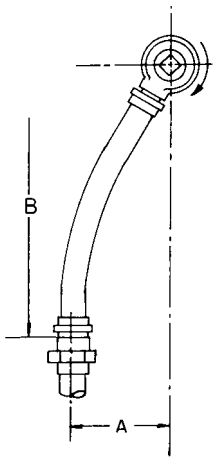


Exhibit C
Example of the correct way to install flexible hose on a Rotary Union.

CAUTION

A straight hose, when fully charged, becomes as rigid as solid pipe. This rigidity, plus the added weight of the fluid media and expansion due to temperature, can drastically shorten the service life of the Rotary Union.

Warranty

Subject to the conditions stated herein, Duff-Norton will repair or replace, without charge, any parts proven to Duff-Norton's satisfaction to be defective in materials or workmanship. Claims must be made within one year, except Series 9000, 8000, and 4000 Series.

Duff-Norton will not repair or replace any parts that become unusable and show clear evidence of improper maintenance, eccentric loading, overloading, excessive heat, chemical or abrasive wear, tampering or abuse. Equipment and accessories not manufactured by Duff-Norton are warranted only to the extent the manufacturer warrants them, and only if the claimed defect arose during normal use, application and service. Equipment that has been altered or modified by anyone without Duff-Norton's authorization is not warranted by Duff-Norton. Except as stated herein, Duff-Norton makes no other warranties, express or implied including warranties of merchantability and fitness for a particular purpose.

DUFF-NORTON TERMS OF SALE

All sales by Seller are made pursuant to the following terms. No other or additional terms or conditions are or will be accepted.

ACCEPTANCE OF ORDERS -

All orders, whether placed directly or through an agent, and all subsequent amendments thereto, are subject to a final approval and acceptance by Seller's main office.

LIMITATION OF WARRANTIES, REMEDIES AND DAMAGES –

THE WARRANTY STATED BELOW IS GIVEN IN PLACE OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR OTHERWISE. NO PROMISE OR AFFIRMATION OF FACT MADE BY ANY AGENT OR REPRESENTATIVE OF SELLER SHALL CONSTITUTE A WARRANTY BY SELLER OR GIVE RISE TO ANY LIABILITY OR OBLIGATION.

Seller warrants that on the date of its delivery to carrier the goods are free from defects in workmanship and materials.

SELLER'S SOLE OBLIGATION IN THE EVENT OF BREACH OF WARRANTY OR CONTRACT OR FOR NEGLIGENCE OR OTHERWISE WITH RESPECT TO GOODS SOLD SHALL BE EXCLUSIVELY LIMITED TO REPAIR OR REPLACEMENT, F.O.B. SELLER'S POINT OF SHIPMENT, OF ANY PARTS WHICH SELLER DETERMINES TO HAVE BEEN DEFECTIVE or if Seller determines that such repair or replacement is not feasible, to a refund of the purchase price upon return of the goods to Seller.

Any action against Seller for breach of warranty, negligence or otherwise must be commenced within one year after such cause of action accrues.

NO CLAIM AGAINST SELLER FOR ANY DEFECT IN THE GOODS SHALL BE VALID OR ENFORCEABLE UNLESS BUYER'S WRITTEN NOTICE THEREOF IS RECEIVED BY SELLER WITHIN ONE YEAR FROM THE DATE OF SHIPMENT.

Seller shall not be liable for any damage, injury or loss arising out of the use of the goods if, prior to such damage, injury or loss, such goods are (1) damaged or misused following Seller's delivery to carrier; (2) not maintained, inspected, or used in compliance with applicable law and Seller's written instructions and recommendations; or (3) installed, repaired, altered or modified without compliance with such law, instructions or recommendations.

UNDER NO CIRCUMSTANCES SHALL SELLER BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES AS THOSE TERMS ARE DEFINED IN SECTION 2-715 OF THE UNIFORM COMMERCIAL CODE.

TERMS OF PAYMENT -

Unless otherwise stated herein, payment of each invoice is required within thirty (30) days after date of shipment. Any balance unpaid after the required payment date shall be subject to a service charge of 1% per month from such date.

PRICE ADJUSTMENTS -

Amendments made by the Buyer to orders already placed shall, without formal notice to the Buyer, be subject to extra charges. If the estimated shipping date for the goods is more than sixty (60) days after date of order, the price of the goods are subject to increase by Seller.

TAXES -

Any sales, use, excise, and other taxes applicable to this transaction and the goods and/or services furnished by Seller are not included in the price and shall be paid by Buyer when due. If Seller pays any such taxes, Buyer shall reimburse Seller upon demand.

INDEMNIFICATION AND SAFE OPERATION -

Buyer shall comply with and require its employees to comply with directions set forth in instructions and manuals furnished by Seller and shall use and require its employees to follow such instructions and manuals and to use reasonable care in the use and maintenance of the goods. Buyer shall not remove or permit anyone to remove any warning or instruction signs on the goods. In the event of personal injury or damage to property or business arising from the use of the goods, Buyer shall, within forty-eight (48) hours thereafter, give Seller written notice of such injury or damage. Buyer shall cooperate with Seller in investigating any such injury or damage and in the defense of any claims arising therefrom.

If Buyer fails to comply with this section or if any injury or damage is caused, in whole or in part, by Buyer's failure to comply with applicable federal or state safety requirements, Buyer shall indemnify and hold Seller harmless against any claims, loss or expense for injury or damage arising from the use of the goods.

GOVERNING LAW -

This agreement shall be governed by and construed under the laws of the State of New York.

DELIVERY AND DELAYS -

Unless otherwise specified herein, deliveries shall be F.O.B. Seller's point of shipment and risk of loss shall pass to Buyer upon Seller's delivery to carrier. All shipping dates are approximate and Seller shall not be liable for loss or damage because of delays occasioned by labor disputes, damage to facilities, or failure of suppliers or subcontractors to meet scheduled deliveries or any other cause beyond Seller's reasonable control or making its performance commercially impracticable.

Not withstanding other provisions hereof, if shipment is delayed at Buyer's request, the goods shall be deemed to be stored at Buyer's risk and expense and Seller may thereupon bill Buyer for the full price and storage costs. Buyer shall pay such bill within 30 days after mailing thereof.

BUYER'S INSPECTION UPON RECEIPT OF SHIPMENT -

Buyer shall inspect the goods as soon as received. If any loss or damage is discovered, Buyer must notify both the carrier and Seller at once. Seller will cooperate with Buyer in filing claims with the carrier.

CHANGES AND CANCELLATION -

Seller reserves the right to change or cancel any order whenever circumstances require allocation of production or delivery or Seller deems change or cancellation to be necessary to comply with applicable laws, ordinances, regulations, directives or administrative actions. Seller reserves the right to make changes in materials or design which it determines appropriate for the goods.

SECURITY INTEREST AND REPOSSESSION -

Until full payment has been made therefor, Seller shall have a security interest in goods shipped to Buyer and the goods shall remain personal property. Upon request Buyer shall execute and deliver to Seller security agreements and financing statements further evidencing Seller's security interest. Buyer authorizes Seller to file a financing statement or statements relating to the goods, without Buyer's signature thereon, as Seller may deem appropriate and appoints Seller as Buyer's attorney-in-fact for the limited purpose of executing (without requiring Seller to do so) financing statements in Buyer's name and performing other acts which Seller deems appropriate to perfect and continue its security interest and to protect and preserve the goods.

In the event Buyer defaults in making any payment due Seller, Seller in addition to any other rights or remedies provided by law, shall have the right, with or without legal process, to enter the place where said goods are located and to repossess the goods in accordance with the Uniform Commercial Code.

ASSURANCES -

Shipment by Seller shall at all times be subject to the prior approval of its credit personnel and Seller may, at any time, decline to make shipment except upon receipt of prior payment or upon other terms and conditions or security satisfactory to such personnel.

PATENTS -

Except as to goods manufactured according to design supplied by Buyer, Seller will defend and hold Buyer free and harmless in a suit or proceeding brought against Buyer insofar as it is based on a claim that use of the goods by Buyer constitutes an infringement of any existing U.S. Patents, provided, however, that Buyer gives Seller prompt written notice of such suit or proceeding; permits Seller, through its counsel, to defend and/or settle the same; and gives Seller all necessary information, assistance and authority to enable Seller so to do. If Buyer's use of the goods is held to constitute infringement and further use is enjoined, Seller shall, at its option, either (i) procure for Buyer the right to continue using the goods; or (ii) replace the goods with non-infringing goods; or (iii) modify the goods to non-infringing goods. The foregoing states Seller's entire liability for patent infringement and shall not be construed to render Seller liable for damages based on product output.

MISCELLANEOUS -

This instrument constitutes the entire agreement between Seller and Buyer, superseding all previous understandings and writings regarding this transaction. Any amendment or modification of this Agreement shall be void unless in writing and signed by Seller.

No delay or omission by Seller in exercising any right or remedy hereunder shall be a waiver thereof or of any other right or remedy, and no single or partial exercise thereof shall preclude any other or further exercise thereof or the exercise of any other right or remedy. All rights and remedies of Seller are cumulative.

Sales made pursuant to this Agreement shall be governed by the Uniform Commercial Code as the same may from time to time be construed and in effect in the state wherein Seller has its main office.

ARBITRATION -

All disputes that may arise between the parties regarding the interpretation of the contract and the legal effect of the contract shall, to the exclusion of any court of law, be arbitrated and determined in accordance with the latest Commercial Arbitration Rules of the American Arbitration Association. The arbitration proceeding shall be held in the city in that state where the principal office of the Seller is located. The parties recognize and consent to the above mentioned arbitration association's jurisdiction over each and every one of them.

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