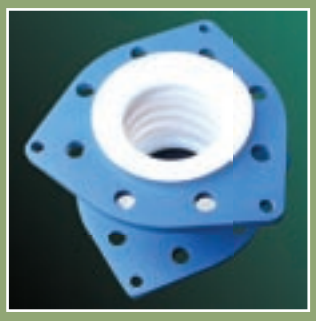
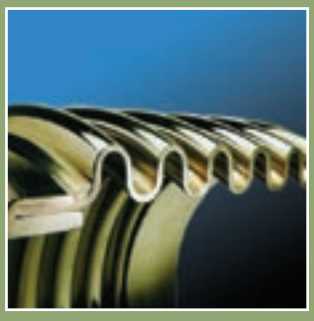
PACIFIC
HOSE FLEX
PTY LTD



03






EXPANSION JOINTS: RUBBER, TEFLON® STAINLESS

Product Guide

ISO 9001

AGA

COMPANY PROFILE

3.02 | Pacific Hoseflex

Pacific Hoseflex (PHF) has been operating out of South East Queensland for over 15 years. This Australian owned and family business was started by Tony and Tina Gray in the early 1990's. Utilizing diverse backgrounds in engineering and 30 years experience, PHF embarked on a venture that has evolved into an extremely successful and still growing business.

Pacific Hoseflex 's management and staff have diversified their engineering skills to hose products, hose fittings and expansion joints which are distributed both nationally and internationally. Our products can be found in the most diverse industries and applications; renewable energy, desalination, hydrocarbon, water, underground mines, automotive, power stations, marinas, food and chemical industries, steel works, instrumentation equipment, armed forces and an almost endless number of fluid and air conveyance applications.

We have progressively incorporated quality and seamless procedures and manufacturing practices in concert with our valuable staff to achieve an all encompassing Quality Management System.

We have been assessed for quality assurance and are certified to ISO 9001:2000. As well a number of major national and international clients have independently audited and endorsed our quality system. We are AGA approved and all welding is completed to Standard AS 4041 (Class 1).

Pacific Hoseflex has always focused on training and we are absolutely committed to safety. We have successfully nurtured many apprentices, up skilled tradesmen and developed a broad range of staff over the years.

For further information contact our sales team on:
http://www.hoseflex.com.au

Machining Team

From left: Chris, Glen, Craig and Tom

Accounts

From left: Karley, Tina and Emily

Hose Assembling Team

From left: Peter, Tim, Brett, Corey, Rich, Bob, Sam, Josh and Luke

Sales

From left: Jason, Ben, Andrew, Tony, Andrew, Sean and Sue

PRODUCT RANGE

3.03 | Complete Range of Pacific Hoseflex

01	Teflon® Hose	
02	Stainless Steel Interlock Hose Stainless Steel Hose	
03	Expansion Joints: Rubber Teflon® Stainless	
04	Composite Hose Ducting Hose Rubber Hose	
05	Fittings	

3.04 | The Range

(SEJ) Single Expansion Joint	Page 3.09
(UEJ) Universal Expansion Joint	Page 3.11
(DEJ) Diesel Expansion Joint	Page 3.12
(DDEJ) Double Diesel Expansion Joint	Page 3.13
(DMEJ) Diesel Multiply Expansion Joint	Page 3.14
(DAEJ) Double Axial Expansion Joint	Page 3.15
(HEJ) Single Hinged Expansion Joint	Page 3.16
(DHEJ) Double Hinged Expansion Joint	Page 3.17
(GEJ) Single Gimbal Expansion Joint	Page 3.18
(DGEJ) Double Gimbal Expansion Joint	Page 3.19
(XT) Externally Pressurised Expansion Joint	Page 3.21
(DXT) Double Externally Pressurised Expansion Joint	Page 3.23
(TEJ) Single Tied Expansion Joint	Page 3.25
(DTEJ) Double Tied Expansion Joint	Page 3.26
Seismic Joint	Page 3.28
Expansion Loops	Page 3.29
(PEJ2) PTFE Expansion Joints 2 Convolutions	Page 3.31
(PEJ3) PTFE Expansion Joints 3 Convolutions	Page 3.32
(PEJ5) PTFE Expansion Joints 5 Convolutions	Page 3.33
(REJ) Rubber Expansion Joint Single Sphere	Page 3.34
(TREJ) Rubber Expansion Joint Twin Sphere	Page 3.36
(FEJ) Fabric Expansion Joints	Page 3.37

3.05 | Metallic Expansion Joints

Introduction

Expansion joints are employed in piping systems to absorb different thermal expansion while containing the system pressure. They are successfully utilised in refineries, chemical plants, fossil and nuclear systems, heating and cooling systems, and cryogenic plants.

Any pipe connecting two points is subject to numerous types of action which result in stresses on the pipe.

Some of the causes of these stresses are:

- Internal or external pressure at working temperature
- Weight of the pipe itself and the parts supported
- Movement imposed on the pipe sections by external restraints
- Thermal expansion

The stress on the wall of piping is related to the force or movement exerted on it by external resistance and the flexibility of the pipe itself.

When either the value of the stresses or the value of the external forces or movements exceeds the maximum allowable value(s), the flexibility of the pipe must be increased artificially. This can be done either by altering the lay out of the pipe or by inserting high flexibility sections.

This is precisely the function of expansion joints.

Depending on the type of movement to be absorbed, expansion joints can be classified as follows:

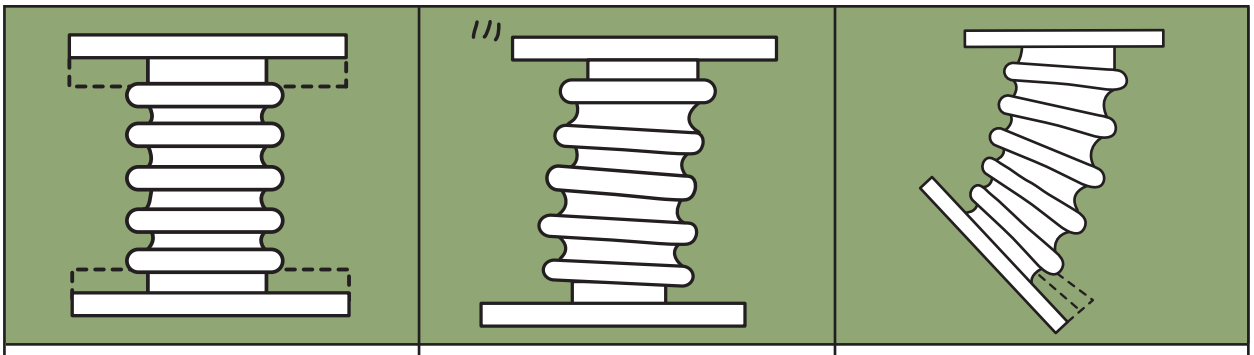
- axial
- universal
- angular (hinged)
- spherical angular (gimbal)
- lateral
- spherical lateral
- pressure balance axial
- pressure balance universal

Design and manufacture

Pacific Hoseflex has a variety of different size expansion joints available from 50 mm to 5000 mm in diameter, with working pressures up to 10,000 kpa. Consideration must be taken into account when elevated temperatures are involved. They reduce both rated movement for a given life cycle and pressure capabilities of the expansion joint.

Bellows operate best at normal pressure ratings temperatures between 70° C to 80° C. The austenitic range of stainless steel is susceptible to high stresses in the presence of corrosive agents, such as chlorides, caustic alkalis, hydrogen sulfide and nitrates.

3.06 | Definition of Movement



Axial Movement	Lateral Movement	Angular Movement
Axial Compression is the dimensional shortening of an Expansion Joint along its longitudinal axis while axial extension is the dimensional lengthening of the expansion joint.	Lateral Deflection is the relative displacement of the two ends of an Expansion Joint perpendicular to its longitudinal axis.	Angular Rotation is the displacement of the longitudinal axis of the Expansion Joint from its initial straight line position into a circular arc.

Cycle Life

This the anticipated number of complete expansions and contractions that a bellow can accommodate in its working life, this is an important consideration with bellow design. This consideration is to ensure the correct balance between the pressure containing characteristics and the movement.

The cycle life expectancy of an expansion joint is affected by the flowing various factors;

- operating pressure
- operating temperature
- the material from which the bellows is made
- the movement per convolution
- the thickness of the bellow
- the convolution pitch
- depth and shape of convolution

After installation any change to any of these factors will impact upon the cycle life.

Quality Management

We have progressively incorporated quality and seamless procedures and manufacturing practices in concert with our valuable staff to achieve an all encompassing Quality Management System - with accredited Quality Assurance, ISO 9001:2000.

Pacific Hoseflex quality control measures - inspection and testing procedures include; inwards goods inspection, in process inspection, final product release inspection and leak detection inspection. There are several different methods for leak detection; dye penetrate examination, x-ray examinations, magnetic particle inspection, hydrostatic test and pneumatic test.

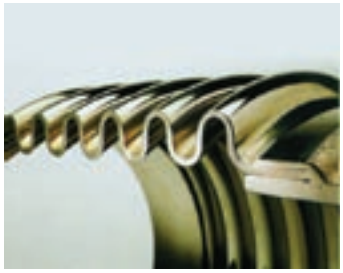
3.07 | Bellow Forming & Material

Bellow forming

The basic method(s) of bellows manufacture is not complicated. There are two ways that a bellows can be manufactured:

1. Mechanical forming can be done by either rolling the convolutions between external and internal wheels.

2. Hydraulic forming, using internal pressure has a much greater life than bellows formed by the other method(s). Bellows shall be hydraulically formed from a tube having only longitudinal seams. When the ratio of corrugation diameter to shell diameter is large, as in small diameter bellows, the units shall be annealed to remove stresses created by the forming operation.



The number of convolutions depends upon the amount of movement the bellow must accommodate or the force that must be used to accomplish the deflection. Since bellows are unique, there are many design considerations which must be evaluated. The convoluted element must be strong enough circumferentially to withstand the line pressure of the system, yet responsive enough longitudinally to flex. The longitudinal load (pressure thrust) must then be absorbed by some other type of device. These are usually anchors, tie rods, hinges or gimbal structures.

Under pressure a bellow will crave to squirm. This can occur when a bellow is subjected to a pressure greater than 1.5 times the design pressure. Squirm can be considered the same as column buckling in a beam under compressive loading. The convolutions deform and even though there is no leaking, both cycle life and pressure capacity is greatly reduced.

Bellow material

Stainless Steel 304
Is a lower grade material than 321 SS with less resistance to corrosion. Applications include diesel engine exhaust manifolds and steam.

Stainless Steel 321
The most common material used for bellow manufacture. It combines excellent mechanical properties with adequate corrosion resistance. Applications include diesel engine exhaust manifolds and steam.

Stainless Steel 316
Has a better corrosion resistance than 321 SS and can be used as an alternative to Incoloy 825. Applications include engine exhaust manifolds, steam and marine services.

Incoloy 825, 800
A high nickel alloy specifically designed for use in aggressive environment. It is very resistant to pitting and crevice corrosion and virtually immune to stress corrosion cracking. It can be used up to a maximum temperature of 425° C. Applications include diesel engine exhaust manifolds, steam, crude oil lines and flue gases.

Inconel 625, 600 and 800
Is a high nickel ally with good corrosion resistant and temperature capability higher than 425° C.

Nickel 200, 253 MA
This alloy has good mechanical properties and excellent corrosion resistance to alkalis, i.e. sodium hydroxide. It also has good electrical, thermal and magneto-strictive properties. Applications include food and synthetic fibre processing, heat exchangers, chemical and electrical industries.

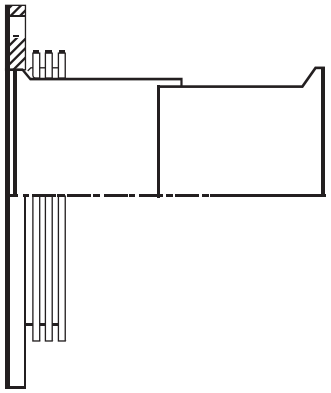
3.08 | Bellow Material

Hastelloy
It has a high-strength, nickel based, corrosion resistant alloy. Other components include molybdenum and chromium. It is well suited for most chemical applications. It has excellent resistance to pitting, stress-corrosion and cracking

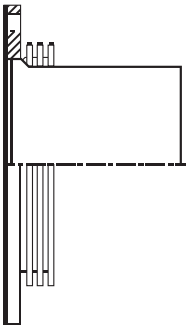
254 SMO
This is a very high end austenitic stainless steel that combines impact toughness resistance to chloride stress corrosion cracking, pitting and crevice corrosion with strength nearly twice that of 300 series stainless steels. In some applications it has been found to be a more cost effective substitute for high nickel and titanium alloys.

Accessories

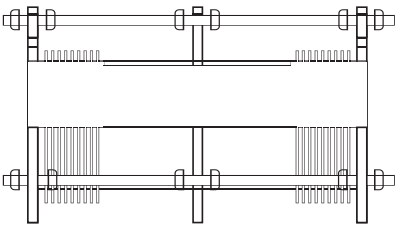
Telescopic Liners
Telescoping liners are used on short expansion joints with large axial movements. When fit close together, they can also be used in systems where the flow can be in either direction.



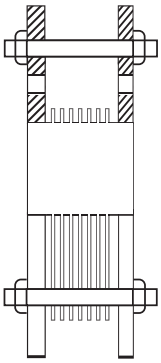
Liners
Liners are used to prevent flow induced vibration or erosion caused by abrasive materials. When lateral movement is required in the expansion joint, the flow liner diameter must be reduced to provide clearance.



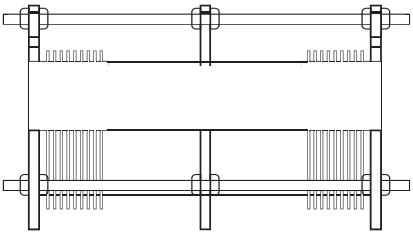
Control Rods
Control Rods are devises that limit the individual travel of each bellows in a universal or dual expansion joint. These rods can also be designed to support external loads. Control rods are not normally designed to absorb the pressure thrust loads.



Tie Rods
Tie Rods are used to restrain the thrust forces created by the internal pressure of the expansion joint. Normally the system anchors are used to withstand the pressure thrust forces.



Limiting Rods
Limiting Rods are used to limit movement to the design capability. In the event of an anchor failure, the rods will absorb the full pressure thrust loading of the expansion joint.



3.09 | Metallic Expansion Joint

Single Expansion Joint (SEJ)

- Used for absorbing axial, angular and small amounts of lateral movement.
- Standard assemblies with flanges, weld ends or a combination of both.
- Pressure thrust will be transmitted onto the pipeline.
- Correct anchoring and guiding must be used.
- Standard working pressures are 240, 700 and 1400 kPa.
- Pressures up to 10,000 kPa available on request.
- Standard diameters up to 5000 mm available on request.

PART NO	NOM	LENGTH		MOVEMENTS*			SPRING	PRESS
	BORE	FF	WW	AXIAL	LATERAL	ANGULAR	RATE	THRUST
	MM	MM	MM	MM	MM	DEG	N/MM	KN
50 SEJ-240	50	145	218	32	12	18	21	1
50 SEJ-700	50	145	218	21	8	18	21	3
50 SEJ-1400	50	145	218	18	7	18	70	6
65 SEJ-240	65	180	234	36	12	18	19	2
65 SEJ-700	65	180	234	28	11	18	57	4
65 SEJ-1400	65	180	234	22	7	18	102	9
80 SEJ-240	80	180	278	34	13	18	12	2
80 SEJ-700	80	180	278	34	13	18	36	6
80 SEJ-1400	80	180	278	25	8	17	130	12
100 SEJ-240	100	190	278	36	13	18	47	3
100 SEJ-700	100	190	278	32	10	18	84	9
100 SEJ-1400	100	190	278	27	7	14	169	19
125 SEJ-240	125	215	313	50	13	18	50	4
125 SEJ-700	125	215	313	37	10	18	87	14
125 SEJ-1400	125	215	313	27	7	14	169	27
150 SEJ-240	150	215	338	50	15	18	50	6
150 SEJ-700	150	215	338	39	9	18	72	19
150 SEJ-1400	150	215	338	26	6	14	330	39
200 SEJ-240	200	225	330	57	16	18	28	11
200 SEJ-700	200	225	330	47	9	17	105	33
200 SEJ-1400	200	225	330	30	6	13	541	66
250 SEJ-240	250	245	341	64	17	18	27	17
250 SEJ-700	250	245	341	62	10	18	120	51
250 SEJ-1400	250	245	341	44	8	13	289	102
300 SEJ-240	300	280	400	76	18	18	28	24
300 SEJ-700	300	280	400	68	12	17	119	70
300 SEJ-1400	300	280	400	43	8	13	290	141
350 SEJ-240	350	270	418	88	15	18	59	29
350 SEJ-700	350	270	418	69	10	15	126	85
350 SEJ-1400	350	270	418	43	6	12	711	170
400 SEJ-240	400	270	418	84	10	17	86	37
400 SEJ-700	400	270	418	49	5	12	433	108
400 SEJ-1400	400	270	418	35	4	10	1013	217
450 SEJ-240	450	270	436	83	8	15	97	46
450 SEJ-700	450	270	436	48	5	11	490	135
450 SEJ-1400	450	270	436	36	4	8	1136	170
500 SEJ-240	500	270	436	92	9	14	74	57

*Non–concurrent

3.10 | Metallic Expansion Joint

PART NO	NOM	LENGTH		MOVEMENTS*			SPRING	PRESS
	BORE	FF	WW	AXIAL	LATERAL	ANGULAR	RATE	THRUST
	MM	MM	MM	MM	MM	DEG	N/MM	KN
500 SEJ-700	500	270	436	58	6	12	375	167
500 SEJ-1400	500	270	436	39	4	8	1268	335
600 SEJ-240	600	290	450	88	8	12	90	80
600 SEJ-700	600	290	450	58	5	10	459	235
600 SEJ-1400	600	290	450	39	3	7	1541	470
650 SEJ-240	650	395	490	105	15	17	92	93
650 SEJ-700	650	395	490	62	10	13	441	271
650 SEJ-1400	650	395	490	58	9	10	1126	542
700 SEJ-240	700	395	490	103	15	17	131	107
700 SEJ-700	700	395	490	61	10	13	463	312
700 SEJ-1400	700	395	490	58	9	10	1322	624
750 SEJ-240	750	395	490	114	13	16	89	124
750 SEJ-700	750	395	490	69	9	12	498	362
750 SEJ-1400	750	395	490	65	8	11	1438	724
800 SEJ-240	800	395	490	116	13	14	98	140
800 SEJ-700	800	395	490	70	8	10	672	408
850 SEJ-240	850	395	490	110	11	13	107	156
850 SEJ-700	850	395	490	70	7	9	1291	455
900 SEJ-240	900	430	500	108	10	12	115	174
900 SEJ-700	900	430	500	67	6	8	1332	508
950 SEJ-240	950	430	500	110	11	13	122	196
950 SEJ-700	950	430	500	68	7	9	1406	572
1000 SEJ-240	1000	395	490	102	8	11	101	214
1000 SEJ-700	1000	395	490	57	4	6	1510	624
1050 SEJ-240	1050	300	480	94	6	8	106	231
1050 SEJ-700	1050	300	480	44	3	5	2376	673
1100 SEJ-240	1100	300	480	96	6	8	142	260
1150 SEJ-240	1150	300	480	94	6	7	159	279
1200 SEJ-240	1200	300	480	92	5	8	264	304
1250 SEJ-240	1250	300	480	90	5	7	317	333
1300 SEJ-240	1300	470	550	122	11	8	342	359
1350 SEJ-240	1350	470	550	118	11	8	369	386
1400 SEJ-240	1400	470	550	118	10	8	392	414
1450 SEJ-240	1450	470	550	110	10	8	421	443
1500 SEJ-240	1500	470	550	110	8	7	448	473

*Non–concurrent

3.11 | Metallic Expansion Joint

Universal Expansion Joint (UEJ)

- Used for absorbing large amounts of axial, angular and lateral movement in low pressure pipelines.
- Standard assemblies with flanges, weld ends or a combination of both.
- Pressure thrust will be transmitted onto the pipeline.
- Correct anchoring and guiding must be used.
- Standard working pressures are 100 and 200 kPa depending on diameter.
- Standard diameters up to 5000 mm available on request.

PART NO	NOM	LENGTH		MOVEMENTS*			SPRING	PRESS
	BORE	FF	WW	AXIAL	LATERAL	ANGULAR	RATE	THRUST
	MM	MM	MM	MM	MM	DEG	N/MM	KN
50 UEJ-200	50	380	460	64	76	18	11	0.8
65 UEJ-200	65	380	460	64	76	18	10	1.4
80 UEJ-200	80	380	460	70	76	18	6	1.8
100 UEJ-200	100	430	526	72	76	18	24	2.8
125 UEJ-200	125	430	526	106	130	18	25	4.0
150 UEJ-200	150	430	576	106	120	18	21	5.6
200 UEJ-200	200	450	560	114	98	18	14	9.4
250 UEJ-200	250	485	582	112	98	18	14	14.8
300 UEJ-200	300	555	700	152	114	18	14	20
350 UEJ-200	350	540	736	178	114	18	30	24
400 UEJ-200	400	540	736	178	114	18	43	30
450 UEJ-200	450	540	772	182	102	18	49	38
500 UEJ-200	500	540	772	182	102	16	37	46
600 UEJ-200	600	540	772	148	86	16	45	66
650 UEJ-200	650	690	790	108	72	15	72	76
700 UEJ-100	700	690	790	111	72	15	82	43
750 UEJ-100	750	690	790	119	70	15	71	50
800 UEJ-100	800	690	790	122	64	15	74	58
850 UEJ-100	850	690	790	112	60	15	79	64
900 UEJ-100	900	690	790	112	59	15	87	71
950 UEJ-100	950	690	790	120	57	15	93	79
1000 UEJ-100	1000	1190	1290	120	54	14	121	85
1050 UEJ-100	1050	1190	1290	78	68	14	127	96
1100 UEJ-100	1100	1190	1290	78	61	14	137	116
1150 UEJ-100	1150	1190	1290	74	63	12	262	125
1200 UEJ-100	1200	1190	1290	84	64	10	209	131
1250 UEJ-100	1250	1290	1380	122	82	12	332	143
1300 UEJ-100	1300	1290	1380	122	82	12	348	155
1350 UEJ-100	1350	1290	1380	120	81	12	362	167
1400 UEJ-100	1400	1290	1380	120	75	12	376	179
1450 UEJ-100	1450	1290	1380	120	73	15	389	183
1500 UEJ-100	1500	1290	1380	118	70	15	398	202

*Non–concurrent

3.12 | Metallic Expansion Joint

Diesel Expansion Joint (DEJ)

- Used for absorbing thermal expansion in exhaust, gas ducting and low pressure systems.
- Standard assemblies with flanges, weld ends or a combination of both.
- Pressure thrust will be transmitted onto pipeline.
- Correct anchoring and guiding must be used.
- Internal flow liners for eliminating velocity and flow problems fitted as standard.
- Standard working pressure is 100 kPa standard diameters up to 5000 mm available on request.

PART NO	NOM	LENGTH		MOVEMENTS*			SPRING	PRESS
	BORE	FF	WW	AXIAL	LATERAL	ANGULAR	RATE	THRUST
	MM	MM	MM	MM	MM	DEG	N/MM	KN
50 DEJ–100	50	145	218	36	12	18	21	0.4
65 DEJ–100	65	180	234	39	12	18	19	0.7
80 DEJ–100	80	180	240	44	13	18	12	0.9
100 DEJ–100	100	190	278	44	13	18	47	1.4
125 DEJ–100	125	215	313	50	13	18	50	2.0
150 DEJ–100	150	215	338	54	15	18	42	2.8
200 DEJ–100	200	225	330	59	16	18	28	4.7
250 DEJ–100	250	245	341	70	17	18	27	7.4
300 DEJ–100	300	280	400	82	18	18	28	10
350 DEJ–100	350	270	418	89	15	18	59	12
400 DEJ–100	400	270	418	96	10	17	86	15
450 DEJ–100	450	270	436	96	8	15	97	19
500 DEJ–100	500	270	436	98	9	14	74	23
600 DEJ–100	600	270	436	96	7	12	90	33
650 DEJ–100	650	385	460	107	12	15	76	38
700 DEJ–100	700	385	460	107	12	15	81	43
750 DEJ–100	750	385	460	107	12	15	65	50
800 DEJ–100	800	385	460	104	11	15	71	58
850 DEJ–100	850	385	460	104	11	14	73	64
900 DEJ–100	900	385	460	100	10	14	81	71
950 DEJ–100	950	385	460	100	9	12	84	79
1000 DEJ–100	1000	330	415	96	6	10	108	85
1050 DEJ–100	1050	330	415	96	6	10	109	96
1100 DEJ–100	1100	330	415	96	5	9	113	116
1150 DEJ–100	1150	305	415	94	5	9	138	125
1200 DEJ–100	1200	330	415	94	8	9	171	131
1250 DEJ–100	1250	480	590	127	11	10	343	143
1300 DEJ–100	1300	480	590	127	11	10	351	155
1350 DEJ–100	1350	480	590	124	10	9	362	167
1400 DEJ–100	1400	480	590	124	10	9	377	179
1450 DEJ–100	1450	480	590	120	9	8	385	183
1500 DEJ–100	1500	480	590	120	9	8	396	202

*Non–concurrent

3.13 | Metallic Expansion Joint

Double Diesel Expansion Joint (DDEJ)

- Used for absorbing large amounts of axial angular and lateral movements in low pressure pipelines.
- Standard assemblies with flanges, weld ends or a combination of both.
- Pressure thrust will be transmitted onto pipeline.
- Correct anchoring and guiding must be used.
- Internal flow liners for eliminating velocity & flow problems fitted as standard.
- Standard working pressure is 100 kPa.
- Standard diameters up to 5000 mm are available on request.

PART NO	NOM	LENGTH		MOVEMENTS*			SPRING	PRESS
	BORE	FF	WW	AXIAL	LATERAL	ANGULAR	RATE	THRUST
	MM	MM	MM	MM	MM	DEG	N/MM	KN
50 DDEJ–100	50	380	460	64	76	18	11	0.4
65 DDEJ–100	65	380	460	64	76	18	16	0.7
80 DDEJ–100	80	380	460	70	76	18	6	0.9
100 DDEJ–100	100	430	526	72	76	18	24	1.4
125 DDEJ–100	125	430	526	106	130	18	25	2.0
150 DDEJ–100	150	430	576	106	120	18	21	2.8
200 DDEJ–100	200	450	560	114	98	18	14	4.7
250 DDEJ–100	250	485	582	112	98	18	14	7.4
300 DDEJ–100	300	555	700	152	114	18	14	10
350 DDEJ–100	350	540	736	178	114	18	30	12
400 DDEJ–100	400	540	736	178	114	18	43	15
450 DDEJ–100	450	540	772	182	102	18	49	19
500 DDEJ–100	500	540	772	182	102	16	37	23
600 DDEJ–100	600	540	854	148	86	16	45	33
650 DDEJ–100	650	690	790	108	72	15	72	38
700 DDEJ–100	700	690	790	111	72	15	82	43
750 DDEJ–100	750	690	790	119	70	15	71	50
800 DDEJ–100	800	690	790	122	64	15	74	58
850 DDEJ–100	850	690	790	112	60	15	79	64
900 DDEJ–100	900	690	790	112	59	15	87	71
950 DDEJ–100	950	690	790	120	57	15	93	79
1000 DDEJ–100	1000	1190	1290	120	54	14	121	85
1050 DDEJ–100	1050	1190	1290	78	68	14	127	96
1100 DDEJ–100	1100	1190	1290	78	61	14	137	116
1150 DDEJ–100	1150	1190	1290	74	63	12	262	125
1200 DDEJ–100	1200	1190	1290	84	64	10	209	131
1250 DDEJ–100	1250	1290	1380	122	82	12	332	143
1300 DDEJ–100	1300	1290	1380	122	82	12	348	155
1350 DDEJ–100	1350	1290	1380	120	81	12	362	167
1400 DDEJ–100	1400	1290	1380	120	75	12	376	179
1450 DDEJ–100	1450	1290	1380	120	73	15	389	183
1500 DDEJ–100	1500	1290	1380	118	70	15	398	202

*Non–concurrent

3.14 | Metallic Expansion Joint

Diesel Multiply Expansion Joint (DMEJ)

- Used for vibration and absorbing thermal expansion in exhaust, gas ducting and low pressure systems.
- Relieves stresses caused by vibration.
- Specially designed multiply element.
- Standard assemblies with flanges, weld ends or a combination of both.
- Pressure thrust will be transmitted onto the pipeline.
- Correct anchoring and guiding must be used.
- Internal flow liners for eliminating velocity and flow problems fitted as standard.
- Standard working pressure is 100 kPa.
- Standard diameters up to 5000 mm are available on request.

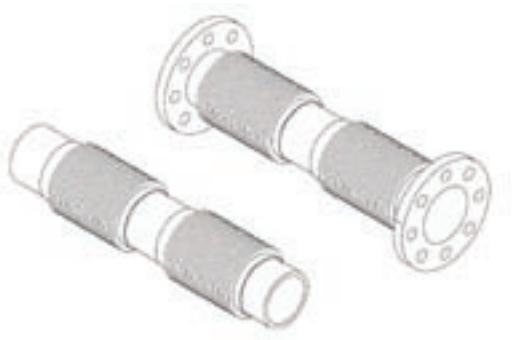
PART NO	NOM	LENGTH		MOVEMENTS*			SPRING	PRESS
	BORE	FF	WW	AXIAL	LATERAL	ANGULAR	RATE	THRUST
	MM	MM	MM	MM	MM	DEG	N/MM	KN
50 DMEJ–100	50	145	218	16	4	12	59	0.4
65 DMEJ–100	65	180	234	29	5	14	36	0.7
80 DMEJ–100	80	180	240	26	6	14	26	0.9
100 DMEJ–100	100	190	278	28	6	14	63	1.4
125 DMEJ–100	125	215	313	28	7	14	69	2.0
150 DMEJ–100	150	215	338	26	8	14	78	2.8
200 DMEJ–100	200	225	330	39	8	13	106	4.7
250 DMEJ–100	250	330	400	84	10	14	38	7.4
300 DMEJ–100	300	330	400	86	11	14	44	10
350 DMEJ–100	350	330	400	88	11	14	46	12
400 DMEJ–100	400	330	400	76	10	13	64	15
450 DMEJ–100	450	330	400	78	11	13	68	19
500 DMEJ–100	500	330	400	81	12	13	75	23
600 DMEJ–100	600	330	400	84	10	12	88	33
650 DMEJ–100	650	400	460	84	10	14	132	38
700 DMEJ–100	700	400	460	84	10	14	136	43
750 DMEJ–100	750	400	490	96	12	14	123	50
800 DMEJ–100	800	400	490	96	12	14	129	58
850 DMEJ–100	850	400	490	98	11	13	139	64
900 DMEJ–100	900	400	490	98	10	13	146	71
950 DMEJ–100	950	400	490	90	10	13	153	79
1000 DMEJ–100	1000	400	490	90	9	10	166	85
1050 DMEJ–100	1050	400	490	90	8	10	164	96
1100 DMEJ–100	1100	400	490	96	9	9	171	116
1150 DMEJ–100	1150	400	490	96	9	9	177	125
1200 DMEJ–100	1200	490	490	106	8	9	267	131
1250 DMEJ–100	1250	490	600	106	8	8	290	143
1300 DMEJ–100	1300	490	600	111	10	8	303	155
1350 DMEJ–100	350	490	600	113	10	6	318	167
1400 DMEJ–100	1400	490	600	113	10	6	322	179
1450 DMEJ–100	1450	490	600	127	9	5	347	183
1500 DMEJ–100	1500	490	600	127	9	5	371	202

*Non–concurrent

3.15 | Metallic Expansion Joint

Double Axial Expansion Joint (DAEJ)

- Used for absorbing large amounts of axial movement.
- Standard assemblies with flanges, weld ends or a combination of both.
- Pressure thrust will be transmitted onto the pipeline.
- Correct anchoring and guiding must be used.
- Standard working pressures are 240, 700 and 1400 kPa.
- Pressures up to 10,000 kPa available on request.
- Internal flow liner for eliminating velocity and flow problems is fitted as standard.
- Standard diameters up to 5000 mm available on request.



PART NO	NOM BORE	LENGTH		MOVEMENTS*	SPRING RATE	PRESS THRUST
		FF	WW	AXIAL		
	MM	MM	MM	MM	N/MM	KN
50 DAEJ–240	50	380	440	64	11	1
50 DAEJ–700	50	380	440	42	35	3
50 DAEJ–1400	50	380	440	36	35	6
65 DAEJ–240	65	450	440	72	10	2
65 DAEJ–700	65	450	440	56	29	4
65 DAEJ–1400	65	450	440	44	51	9
80 DAEJ–240	80	450	440	68	6	2
80 DAEJ–700	80	450	440	68	18	6
80 DAEJ–1400	80	450	440	50	65	12
100 DAEJ–240	100	450	580	72	24	3
100 DAEJ–700	100	450	580	64	42	9
100 DAEJ–1400	100	450	580	46	85	19
125 DAEJ–240	125	450	580	100	25	4
125DAEJ–700	125	450	580	72	44	14
125 DAEJ–1400	125	450	580	52	85	27
150 DAEJ–240	150	450	580	102	21	6
150 DAEJ–700	150	450	580	78	36	19
150 DAEJ–1400	150	450	580	52	165	39
200 DAEJ–240	200	450	580	114	14	11
200 DAEJ–700	200	450	580	94	53	33
200 DAEJ–1400	200	450	580	60	271	66
250 DAEJ–240	250	470	582	128	14	17
250 DAEJ–700	250	470	582	124	60	51
250 DAEJ–1400	250	470	582	88	145	102
300 DAEJ–240	300	555	700	152	14	24
300 DAEJ–700	300	555	700	136	60	70
300 DAEJ–1400	300	555	700	94	145	141
350 DAEJ–240	350	520	736	176	30	29
350 DAEJ–700	350	520	736	138	63	85
350 DAEJ–1400	350	520	736	86	355	170
400 DAEJ–240	400	540	736	168	43	37
400 DAEJ–700	400	540	736	98	217	108
400 DAEJ–1400	400	540	736	70	507	217
450 DAEJ–240	450	540	772	166	49	46
450 DAEJ–700	450	540	772	96	245	135
450 DAEJ–1400	450	540	772	72	568	170
500 DAEJ–240	500	540	772	184	37	57
500 DAEJ–700	500	540	772	116	188	167
500 DAEJ–1400	500	540	772	78	634	335
600 DAEJ–240	600	580	854	148	45	80
600 DAEJ–700	600	580	854	116	230	235
600 DAEJ–1400	600	580	845	78	771	470

*Non–concurrent

3.16 | Metallic Expansion Joint

Single Hinge Expansion Joint (HEJ)

- Used for absorbing angular movement in one plane only.
- Movement of bellows is more controlled.
- Standard assemblies with flanges, weld ends or a combination of both.
- Internal flow liners for eliminating velocity problems may be fitted.
- Anchors only required to absorb spring forces.
- Must be used in pairs with another hinge.
- Pressure thrust is restrained by the hinges.
- Standard working pressures are 240, 700 & 1400 kPa.
- Pressure up to 4000 kPa available on request.
- Standard diameters up to 5000 mm available on request.

PART NO	NOM	LENGTH		MOVEMENTS*		ANG SPRING
	BORE	FF	WW	± DEGREES	TOTAL DEGREES	RATE
	MM	MM	MM	MM	MM	NM/DEG
50 HEJ–240	50	145	218	18	36	0.2
50 HEJ–700	50	145	218	18	36	0.6
50 HEJ–1400	50	145	218	18	36	0.6
65 HEJ–240	65	180	234	18	36	0.2
65 HEJ–700	65	180	234	18	36	0.7
65 HEJ–1400	65	180	234	18	36	1.3
80 HEJ–240	80	180	240	18	36	0.2
80 HEJ–700	80	180	240	18	36	0.6
80 HEJ–1400	80	180	240	17	34	2.2
100 HEJ–240	100	190	278	18	36	1.3
100 HEJ–700	100	190	278	18	36	2.2
100 HEJ–1400	100	190	278	17	34	4.6
125 HEJ–240	125	215	313	18	36	1.9
125 HEJ–700	125	215	313	18	36	3.4
125 HEJ–1400	125	215	313	14	28	6.6
150 HEJ–240	150	215	338	18	36	2.3
150 HEJ–700	150	215	338	18	36	3.9
150 HEJ–1400	150	215	338	14	28	18.2
200 HEJ–240	200	225	330	18	36	2.6
200 HEJ–700	200	225	330	17	34	9.8
200 HEJ–1400	200	225	330	13	26	50
250 HEJ–240	250	245	341	18	36	4
250 HEJ–700	250	245	341	18	36	17
250 HEJ–1400	250	245	341	13	26	42
300 HEJ–240	300	280	400	18	36	6
300 HEJ–700	300	280	400	17	34	23
300 HEJ–1400	300	280	400	13	26	58
350 HEJ–240	350	400	540	18	36	14
350 HEJ–700	350	400	540	15	30	30
350 HEJ–1400	350	400	540	12	24	170
400 HEJ–240	400	400	540	17	34	26
400 HEJ–700	400	400	540	12	24	132
400 HEJ–1400	400	400	540	10	20	308
450 HEJ–240	450	450	590	15	30	36
450 HEJ–700	450	450	590	11	22	186
450 HEJ–1400	450	450	590	8	16	436
500 HEJ–240	500	450	590	14	28	35
500 HEJ–700	500	450	590	12	24	176
500 HEJ–1400	500	450	590	8	16	595
600 HEJ–240	600	450	590	12	24	59
600 HEJ–700	600	450	590	10	20	303
600 HEJ–1400	600	450	590	7	14	1015

*Non–concurrent

3.17 | Metallic Expansion Joint

Double Hinge Expansion Joint (DHEJ)

- Used for absorbing large amounts of lateral movement in one plane.
- Movement of bellows is more controlled.
- Standard assemblies with flanges, weld ends or a combination of both.
- Internal flow liners for eliminating velocity problems may be fitted.
- Anchors only required to absorb spring forces.
- Pressure thrust is restrained by the hinges.
- Standard working pressures are 240, 700 and 1400 kPa.
- Pressures up to 4000 kPa available on request.
- Standard diameters up to 5000 mm are available on request.

PART NO	NOM	LENGTH		MOVEMENTS*		SPRING RATE
	BORE	FF	WW	± LATERAL	TOTAL LATERAL	LATERAL
	MM	MM	MM	MM	MM	N/MM
50 DHEJ–240	50	600	632	94	188	0.1
50 DHEJ–700	50	600	632	94	188	0.4
50 DHEJ–1400	50	600	632	94	188	0.4
65 DHEJ–240	65	600	632	81	162	0.3
65 DHEJ–700	65	600	632	81	162	0.8
65 DHEJ–1400	65	600	632	81	162	1.3
80 DHEJ–240	80	600	632	76	152	0.3
80 DHEJ–700	80	600	632	76	152	1.2
80 DHEJ–1400	80	600	632	76	152	4.2
100 DHEJ–240	100	600	632	64	128	1.4
100 DHEJ–700	100	600	632	64	128	2.5
100 DHEJ–1400	100	600	632	64	128	5.1
125 DHEJ–240	125	600	761	88	176	1.6
125 DHEJ–700	125	600	761	88	176	2.7
125 DHEJ–1400	125	600	761	88	176	5.2
150 DHEJ–240	150	619	813	88	176	2.2
150 DHEJ–700	150	619	813	88	176	3.7
150 DHEJ–1400	150	619	813	88	176	16.9
200 DHEJ–240	200	698	892	106	212	1.8
200 DHEJ–700	200	698	892	106	212	6.8
200 DHEJ–1400	200	698	892	106	212	35
250 DHEJ–240	250	800	994	112	224	3
250 DHEJ–700	250	800	994	112	224	17
250 DHEJ–1400	250	800	994	112	224	41
300 DHEJ–240	300	800	994	115	230	7
300 DHEJ–700	300	800	994	115	230	22
300 DHEJ–1400	300	800	994	108	216	42
350 DHEJ–240	350	880	1080	127	254	8
350 DHEJ–700	350	880	1080	123	246	23
350 DHEJ–1400	350	880	1080	87	174	101
400 DHEJ–240	400	1105	1320	149	298	7
400 DHEJ–700	400	1105	1320	144	288	19
400 DHEJ–1400	400	1105	1320	100	200	73
450 DHEJ–240	450	1105	1320	163	326	7
450 DHEJ–700	450	1105	1320	146	292	24
450 DHEJ–1400	450	1105	1320	89	178	96
500 DHEJ–240	500	1225	1440	164	328	11
500 DHEJ–700	500	1225	1440	126	252	33
500 DHEJ–1400	500	1225	1440	118	236	119
600 DHEJ–240	600	1435	1650	172	344	14
600 DHEJ–700	600	1435	1650	107	214	92
600 DHEJ–1400	600	1435	1650	101	202	184

*Non–concurrent

3.18 | Metallic Expansion Joint

Single Gimbal Expansion Joint (GEJ)

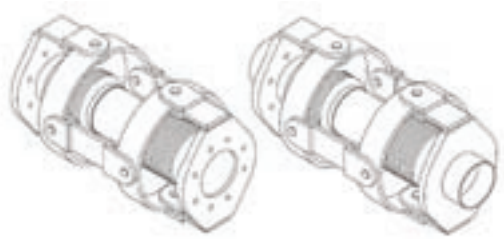
- Used for absorbing angular movement in any plane.
- Movement of bellows is more controlled.
- Standard assemblies with flanges, weld ends or a combination of both.
- Internal flow liners for eliminating velocity problems may be fitted.
- Anchors only required to absorb spring forces.
- Must be in pairs with another gimbal
- Pressure thrust is restrained by the hardware.
- Standard working pressures are 240, 700 and 1400 kPa.
- Pressures up to 4000 kPa available on request.
- Standard diameters up to 5000 mm available on request.

PART NO	NOM	LENGTH		MOVEMENTS*		ANG SPRING
	BORE	FF	WW	± DEGREES	TOTAL DEGREES	RATE
	MM	MM	MM	MM	MM	NM/DEG
50 GEJ–240	50	145	218	18	36	0.2
50 GEJ–700	50	145	218	18	36	0.6
50 GEJ–1400	50	145	218	18	36	0.6
65 GEJ–240	65	180	234	18	36	0.2
65 GEJ–700	65	180	234	18	36	0.7
65 GEJ–1400	65	180	234	18	36	1.3
80 GEJ–240	80	180	240	18	36	0.2
80 GEJ–700	80	180	240	18	36	0.6
80 GEJ–1400	80	180	240	17	34	2.2
100 GEJ–240	100	190	278	18	36	1.3
100 GEJ–700	100	190	278	18	36	2.2
100 GEJ–1400	100	190	278	17	34	4.6
125 GEJ–240	125	215	313	18	36	1.9
125 GEJ–700	125	215	313	18	36	3.4
125 GEJ–1400	125	215	313	14	28	6.6
150 GEJ–240	150	215	338	18	36	2.3
150 GEJ–700	150	215	338	18	36	3.9
150 GEJ–1400	150	215	338	14	28	18.2
200 GEJ–240	200	225	330	18	36	2.6
200 GEJ–700	200	225	330	17	34	9.8
200 GEJ–1400	200	225	330	13	26	50
250 GEJ–240	250	245	341	18	36	4
250 GEJ–700	250	245	341	18	36	17
250 GEJ–1400	250	245	341	13	26	42
300 GEJ–240	300	280	400	18	36	6
300 GEJ–700	300	280	400	17	34	23
300 GEJ–1400	300	280	400	13	26	58
350 GEJ–240	350	400	540	18	36	14
350 GEJ–700	350	400	540	15	30	30
350 GEJ–1400	350	400	540	12	24	170
400 GEJ–240	400	400	540	17	34	26
400 GEJ–700	400	400	540	12	24	132
400 GEJ–1400	400	400	540	10	20	308
450 GEJ–240	450	450	590	15	30	36
450 GEJ–700	450	450	590	11	22	186
450 GEJ–1400	450	450	590	8	16	436
500 GEJ–240	500	450	590	14	28	35
500 GEJ–700	500	450	590	12	24	176
500 GEJ–1400	500	450	590	8	16	595
600 GEJ–240	600	540	680	12	24	59
600 GEJ–700	600	540	680	10	20	303
600 GEJ–1400	600	540	680	7	14	1015

*Non–concurrent

3.19 | Metallic Expansion Joint

Double Gimbal Expansion Joint (DGEJ)



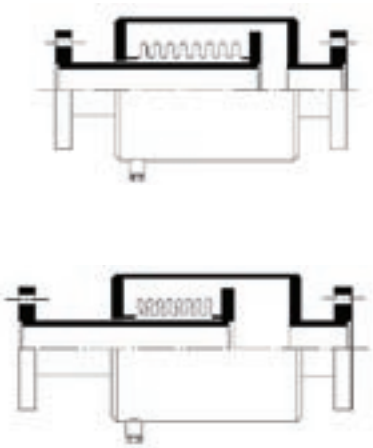
- Used for absorbing large amounts of lateral movement in all planes.
- Movement of bellows is more controlled.
- Standard assemblies with flanges, weld ends or a combination of both.
- Internal flow liners for eliminating velocity problems may be fitted.
- Anchors only require to absorb spring forces.
- Pressure thrust is restrained by the hardware.
- Standard working pressures are 240, 700 and 1400 kPa.
- Pressures up to 4000 kPa available on request.
- Standard diameters up to 5000 mm available on request.

PART NO	NOM	LENGTH		MOVEMENTS*		SPRING RATE
	BORE	FF	WW	± LATERAL	TOTAL LATERAL	LATERAL
	MM	MM	MM	MM	MM	N/MM
50 DGEJ–240	50	600	632	94	188	0.1
50 DGEJ–700	50	600	632	94	188	0.4
50 DGEJ–1400	50	600	632	94	188	0.4
65 DGEJ–240	65	600	632	81	162	0.3
65 DGEJ–700	65	600	632	81	162	0.8
65 DGEJ–1400	65	600	632	81	162	1.3
80 DGEJ–240	80	600	632	76	152	0.3
80 DGEJ–700	80	600	632	76	152	1.2
80 DGEJ–1400	80	600	632	76	152	4.2
100 DGEJ–240	100	600	632	64	128	1.4
100 DGEJ–700	100	600	632	64	128	2.5
100 DGEJ–1400	100	600	632	64	128	5.1
125 DGEJ–240	125	600	761	88	176	1.6
125 DGEJ–700	125	600	761	88	176	2.7
125 DGEJ–1400	125	600	761	88	176	5.2
150 DGEJ–240	150	619	813	88	176	2.2
150 DGEJ–700	150	619	813	88	176	3.7
150 DGEJ–1400	150	619	813	88	176	16.9
200 DGEJ–240	200	760	970	109	218	1.8
200 DGEJ–700	200	760	970	109	218	6.8
200 DGEJ–1400	200	760	970	109	218	35
250 DGEJ–240	250	850	1060	114	228	3
250 DGEJ–700	250	850	1060	114	228	17
250 DGEJ–1400	250	850	1060	114	228	41
300 DGEJ–240	300	890	1120	115	230	7
300 DGEJ–700	300	890	1120	115	230	22
300 DGEJ–1400	300	890	1120	108	216	42
350 DGEJ–240	350	1230	1450	127	254	8
350 DGEJ–700	350	1230	1450	123	246	23
350 DGEJ–1400	350	1230	1450	87	174	101
400 DGEJ–240	400	1230	1450	149	298	7
400 DGEJ–700	400	1230	1450	144	288	19
400 DGEJ–1400	400	1230	1450	100	200	73
450 DGEJ–240	450	1570	1780	163	326	7
450 DGEJ–700	450	1570	1780	146	292	24
450 DGEJ–1400	450	1570	1780	89	178	96
500 DGEJ–240	500	1630	1840	164	328	11
500 DGEJ–700	500	1630	1840	126	252	33
500 DGEJ–1400	500	1630	1840	118	236	119
600 DGEJ–240	600	1670	1880	172	344	14
600 DGEJ–700	600	1670	1880	107	214	92
600 DGEJ–1400	600	1670	1880	101	202	184

*Non–concurrent

3.20 | Metallic Expansion Joint

External Pressurised Expansion Joints



The XT Externally Pressurized Expansion Joint is designed so that the pressure is external to the bellows whilst the inside is at atmospheric pressure. With this design, when a pipeline expands, the expansion joint compresses, but in doing so it stretches the bellows. The result of this is that many convolutions act together to allow a large amount of axial movement because under external pressure the bellows is completely stable.

The XT style of the joint is relatively inexpensive and is designed primarily to fit the following applications:

a) In tunnels or locations where articulated joints can not be used but where large amounts of axial expansion have to be absorbed. It would normally be less expensive to install one XT joint than to divide the pipeline up into several sets of expansion joint(s), anchors and guides. It is impractical to use more than two normal bellows together because of the tendency of the bellows to squirm once a certain length–diameter ratio is exceeded.

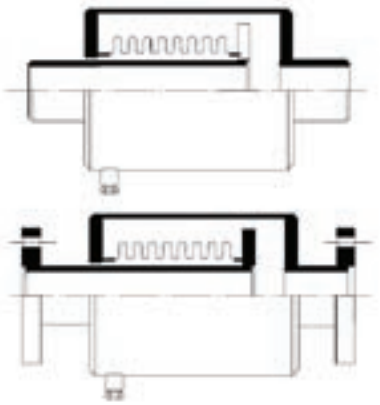
b) At extremely high pressure even short bellows can become unstable under internal pressure. This can be overcome but the use of an XT type joint, which has the bellows under tension and therefore stabilised.

c) Where it is undesirable to have solids accumulate in the convolutions of an expansion joint, the XT can be fitted with drains or manholes to facilitate the regular cleaning out of these areas.

3.21 | Metallic Expansion Joint

Externally Pressurised Expansion Joint (XT)

- Used for absorbing large amounts of axial movement.
- Standard assemblies with flanges, weld ends or a combination of both.
- Pressure thrust will be transmitted onto the pipeline.
- Bellows element is externally pressurised.
- Totally enclosed for maximum safety.
- Smooth flow eliminates the need for liners.
- Available with optional drain port.
- Drains naturally due to gravity.
- Correct anchoring and guiding must be used.
- Standard working pressures are 1000 and 2000 kPa.
- Pressures up to 4000 kPa available on request.



PART NO	NOM BORE	PRESSURE	MOVEMENT	LENGTH	PRESS THRUST
	MM	KPA	MM	FF WW	KN
25 XT-1000-100	25	1000	100	660	5.4
25 XT-1000-150	25	1000	150	914	5.4
25 XT-1000-200	25	1000	200	1168	5.4
25 XT-2000-100	25	2000	100	660	11.5
25 XT-2000-150	25	2000	150	914	11.5
25 XT-2000-200	25	2000	200	1168	11.5
40 XT-1000-100	40	1000	100	660	7.9
40 XT-1000-150	40	1000	150	914	7.9
40 XT-1000-200	40	1000	200	1168	7.9
40 XT-2000-100	40	2000	100	660	16.6
40 XT-2000-150	40	2000	150	914	16.6
40 XT-2000-200	40	2000	200	1168	16.6
50 XT-1000-100	50	1000	100	660	9.5
50 XT-1000-150	50	1000	150	914	9.5
50 XT-1000-200	50	1000	200	1168	9.5
50 XT-2000-100	50	2000	100	660	19.9
50 XT-2000-150	50	2000	150	914	19.9
50 XT-2000-200	50	2000	200	1168	19.9
65 XT-1000-100	65	1000	100	660	12.2
65 XT-1000-150	65	1000	150	914	12.2
65 XT-1000-200	65	1000	200	1168	12.2
65 XT-2000-100	65	2000	100	660	24.6
65 XT-2000-150	65	2000	150	914	24.6
65 XT-2000-200	65	2000	200	1168	24.6
80 XT-1000-100	80	1000	100	660	16.7
80 XT-1000-150	80	1000	150	914	16.7
80 XT-1000-200	80	1000	200	1168	16.7
80 XT-2000-100	80	2000	100	660	34.1
80 XT-2000-150	80	2000	150	914	34.1
80 XT-2000-200	80	2000	200	1168	34.1

3.22 | Metallic Expansion Joint

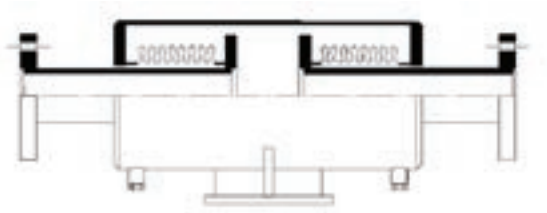
External Pressurised Expansion Joints

PART NO	NOM BORE	PRESSURE	MOVEMENT	LENGTH	PRESS THRUST
	MM	KPA	MM	FF WW	KN
100 XT–1000–100	100	1000	100	660	23.4
100 XT–1000–150	100	1000	150	914	23.4
100 XT–1000–200	100	1000	200	1220	23.4
100 XT–2000–100	100	2000	100	660	47.4
100 XT–2000–150	100	2000	150	914	47.4
100 XT–2000–200	100	2000	200	1168	47.4
150 XT–1000–100	150	1000	100	660	41.4
150 XT–1000–150	150	1000	150	940	41.4
150 XT–1000–200	150	1000	200	1220	41.4
150 XT–2000–100	150	2000	100	660	84.7
150 XT–2000–150	150	2000	150	910	84.7
150 XT–2000–200	150	2000	200	1220	84.7
200 XT–1000–100	200	1000	100	660	76.1
200 XT–1000–150	200	1000	150	940	76.1
200 XT–1000–200	200	1000	200	1220	76.1
200 XT–2000–100	200	2000	100	660	154.1
200 XT–2000–150	200	2000	150	940	154.1
200 XT–2000–200	200	2000	200	1220	154.1
250 XT–1000–100	250	1000	100	660	93.2
250 XT–1000–150	250	1000	150	940	93.2
250 XT–1000–200	250	1000	200	1220	93.2
250 XT–2000–100	250	2000	100	660	189.1
250 XT–2000–150	250	2000	150	940	189.1
250 XT–2000–200	250	2000	200	1270	189.1
300 XT–1000–100	300	1000	100	760	141.7
300 XT–1000–150	300	1000	150	1010	141.7
300 XT–1000–200	300	1000	200	1270	141.7
300 XT–2000–100	300	2000	100	760	273
300 XT–2000–150	300	2000	150	1010	273
300 XT–2000–200	300	2000	200	1270	273
350 XT–1000–100	350	1000	100	760	158
350 XT–1000–150	350	1000	150	1010	158
350 XT–1000–200	350	1000	200	1270	158
350 XT–2000–100	350	2000	100	760	312
350 XT–2000–150	350	2000	150	1010	312
350 XT–2000–200	350	2000	200	1270	312
400 XT–1000–100	400	1000	100	760	198
400 XT–1000–150	400	1000	150	1010	198
400 XT–1000–200	400	1000	200	1270	198
400 XT–2000–100	400	2000	100	760	403
400 XT–2000–150	400	2000	150	1010	403
400 XT–2000–200	400	2000	200	1270	403

3.23 | Metallic Expansion Joint

Double Externally Pressurised Expansion Joint (DXT)

- Used for absorbing large amounts of axial movement.
- Standard assemblies with flanges, weld ends or a combination of both.
- Pressure thrust will be transmitted onto the pipeline.
- Bellows element is externally pressurised.
- Totally enclosed for maximum safety.
- Smooth flow eliminates the need for liners.
- Available with optional drain port.
- Drains naturally due to gravity.
- Correct anchoring and guiding must be used.
- Standard working pressures are 1000 and 2000 kPa.
- Pressures up to 4000 kPa available on request.



PART NO	NOM BORE	PRESSURE	MOVEMENT	LENGTH	PRESS THRUST
	MM	KPA	MM	FF WW	KN
25 DXT-1000-200	25	1000	200	1220	5.4
25 DXT-1000-300	25	1000	300	1727	5.4
25 DXT-2000-200	25	2000	200	1220	11.5
25 DXT-2000-300	25	2000	300	1727	11.5
40 DXT-1000-200	40	1000	200	1220	7.9
40 DXT-1000-300	40	1000	300	1727	7.9
40 DXT-2000-200	40	2000	200	1220	16.6
40 DXT-2000-300	40	2000	300	1727	16.6
50 DXT-1000-200	50	1000	200	1220	9.5
50 DXT-1000-300	50	1000	300	1727	9.5
50 DXT-1000-400	50	1000	400	2235	9.5
50 DXT-2000-200	50	2000	200	1220	19.9
50 DXT-2000-300	50	2000	300	1727	19.9
50 DXT-2000-400	50	2000	400	2235	19.9
65 DXT-1000-200	65	1000	200	1220	12.2
65 DXT-1000-300	65	1000	300	1727	12.2
65 DXT-1000-400	65	1000	400	2235	12.2
65 DXT-2000-200	65	2000	200	1220	24.6
65 DXT-2000-300	65	2000	300	1727	24.6
65 DXT-2000-400	65	2000	400	2235	24.6
80 DXT-1000-200	80	1000	200	1220	16.7
80 DXT-1000-300	80	1000	300	1727	16.7
80 DXT-1000-400	80	1000	400	2235	16.7
80 DXT-2000-200	80	2000	200	1220	34.1
80 DXT-2000-300	80	2000	300	1727	34.1
80 DXT-2000-400	80	2000	400	2235	34.1
100 DXT-1000-200	100	1000	200	1220	23.4
100 DXT-1000-300	100	1000	300	1727	23.4
100 DXT-1000-400	100	1000	400	2235	23.4
100 DXT-2000-200	100	2000	200	1220	47.7
100 DXT-2000-300	100	2000	300	1727	47.7
100 DXT-2000-400	100	2000	400	2235	47.7

3.24 | Metallic Expansion Joint

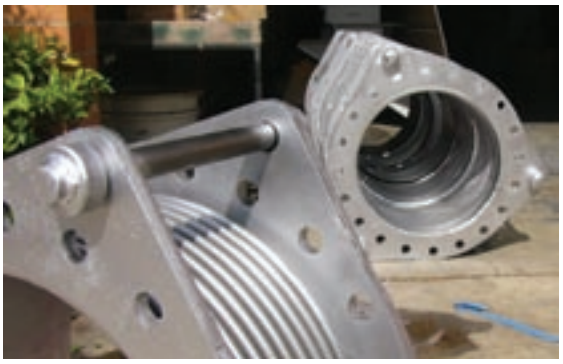
Double Externally Pressurised Expansion Joint

PART NO	NOM BORE	PRESSURE	MOVEMENT	LENGTH	PRESS THRUST
	MM	KPA	MM	FF WW	KN
150 DXT–1000–200	150	1000	200	1220	41.4
150 DXT–1000–300	150	1000	300	1778	41.4
150 DXT–1000–400	150	1000	400	2337	41.4
150 DXT–2000–200	150	2000	200	1220	84.7
150 DXT–2000–300	150	2000	300	1778	84.7
150 DXT–2000–400	150	2000	400	2337	84.7
200 DXT–1000–200	200	1000	200	1220	76.1
200 DXT–1000–300	200	1000	300	1778	76.1
200 DXT–1000–400	200	1000	400	2337	76.1
200 DXT–2000–200	200	2000	200	1220	154.1
200 DXT–2000–300	200	2000	300	1778	154.1
200 DXT–2000–400	200	2000	400	2337	154.1
250 DXT–1000–200	250	1000	200	1220	93.2
250 DXT–1000–300	250	1000	300	1778	93.2
250 DXT–1000–400	250	1000	400	2337	93.2
250 DXT–2000–200	250	2000	200	1220	189.1
250 DXT–2000–300	250	2000	300	1778	189.1
250 DXT–2000–400	250	2000	400	2337	189.1
300 DXT–1000–200	300	1000	200	1420	141.7
300 DXT–1000–300	300	1000	300	1920	141.7
300 DXT–1000–400	300	1000	400	2440	141.7
300 DXT–2000–200	300	2000	200	1420	273
300 DXT–2000–300	300	2000	300	1920	273
300 DXT–2000–400	300	2000	400	2440	273
350 DXT–1000–200	350	1000	200	1420	158
350 DXT–1000–300	350	1000	300	1920	158
350 DXT–1000–400	350	1000	400	2440	158
350 DXT–2000–200	350	2000	200	1420	312
350 DXT–2000–300	350	2000	300	1920	312
350 DXT–2000–400	350	2000	400	2440	312
400 DXT–1000–200	400	1000	200	1420	198
400 DXT–1000–300	400	1000	300	1920	198
400 DXT–1000–400	400	1000	400	2440	198
400 DXT–2000–200	400	2000	200	1420	403
400 DXT–2000–300	400	2000	300	1920	403
400 DXT–2000–400	400	2000	400	2440	403

3.25 | Metallic Expansion Joint

Single Tied Expansion Joint (TEJ)

- Used for absorbing pump vibration, lateral movement and minor pipeline misalignment.
- Standard assemblies with flanges, weld ends or a combination of both.
- Anchors required to absorb spring rate forces only.
- Pressure thrust is restrained by the tie rods.
- Standard working pressures are 240, 700, 1400 kPa.
- Pressures up to 4000 kPa are avaliable.
- Standard diameters up to 5000 mm are available on request.

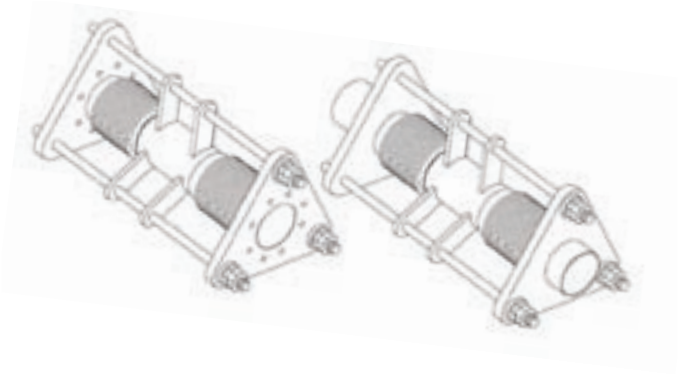


PART NO	NOM	LENGTH		MOVEMENTS*		SPRING RATE
	BORE	FF	WW	± LATERAL	TOTAL LATERAL	LATERAL
	MM	MM	MM	MM	MM	N/MM
50 TEJ–240	50	145	218	12	24	12
50 TEJ–700	50	145	218	8	15	88
50 TEJ–1400	50	145	218	7	13	88
65 TEJ–240	65	180	234	12	24	23
65 TEJ–700	65	180	234	11	21	70
65 TEJ–1400	65	180	234	7	14	126
80 TEJ–240	80	180	240	13	25	18
80 TEJ–700	80	180	240	13	25	54
80 TEJ–1400	80	180	240	8	16	198
100 TEJ–240	100	190	278	12	25	86
100 TEJ–700	100	190	278	10	20	152
100 TEJ–1400	100	190	278	7	14	309
125 TEJ–240	125	215	313	13	26	111
125 TEJ–700	125	215	313	10	20	195
125 TEJ–1400	125	215	313	7	14	381
150 TEJ–240	150	215	338	15	30	131
150 TEJ–700	150	215	338	9	18	228
150 TEJ–1400	150	215	338	6	11	1048
200 TEJ–240	200	225	330	16	32	150
200 TEJ–700	200	225	330	9	18	562
200 TEJ–1400	200	225	330	6	12	2897
250 TEJ–240	250	245	341	17	34	196
250 TEJ–700	250	245	341	10	19	855
250 TEJ–1400	250	245	341	8	14	2071
300 TEJ–240	300	280	400	18	36	184
300 TEJ–700	300	280	400	12	22	797
300 TEJ–1400	300	280	400	8	15	1945
350 TEJ–240	350	400	540	15	30	537
350 TEJ–700	350	400	540	10	19	1142
350 TEJ–1400	350	400	540	6	12	3467
400 TEJ–240	400	400	540	10	20	544
400 TEJ–700	400	400	540	5	10	1841
400 TEJ–1400	400	400	540	4	7	4314
450 TEJ–240	450	450	590	8	16	477
450 TEJ–700	450	450	590	5	9	1574
450 TEJ–1400	450	450	590	4	7	5270
500 TEJ–240	500	450	590	9	18	843
500 TEJ–700	500	450	590	6	11	2288
500 TEJ–1400	500	450	590	4	8	5350
600 TEJ–240	600	450	590	7	14	1122
600 TEJ–700	600	450	590	4	9	4954
600 TEJ–1400	600	450	590	3	6	9468

*Non–concurrent

3.26 | Metallic Expansion Joint

Double Tied Expansion Joint (DTEJ)



- Used for absorbing large amounts of lateral movement.
- Standard assemblies with flanges, weld ends or a combination of both.
- Internal flow liners for eliminating velocity and flow problems may be fitted.
- Anchors required to absorb spring rate forces only.
- Pressure thrust is restrained by the tie rods.
- Standard working pressures are 240, 700 and 1400 kPa.
- Pressures up to 4000 kPa available on request.
- Standard diameters up to 5000 mm are available on request.

PART NO	NOM	LENGTH		MOVEMENTS*		SPRING RATE
	BORE	FF	WW	± LATERAL	TOTAL LATERAL	LATERAL
	MM	MM	MM	MM	MM	N/MM
50 DTEJ–240	50	600	632	94	188	0.1
50 DTEJ–700	50	600	632	94	188	0.4
50 DTEJ–1400	50	600	632	94	188	0.4
65 DTEJ–240	65	600	632	81	162	0.3
65 DTEJ–700	65	600	632	81	162	0.8
65 DTEJ–1400	65	600	632	81	162	1.3
80 DTEJ–240	80	600	632	76	152	0.4
80 DTEJ–700	80	600	632	76	152	1.2
80 DTEJ–1400	80	600	632	76	152	4.2
100 DTEJ–240	100	600	632	64	128	1.4
100 DTEJ–700	100	600	632	64	128	2.5
100 DTEJ–1400	100	600	632	64	128	5.1
125 DTEJ–240	125	600	761	88	176	1.6
125 DTEJ–700	125	600	761	88	176	2.7
125 DTEJ–1400	125	600	761	88	176	5.2
150 DTEJ–240	150	619	813	88	176	2.2
150 DTEJ–700	150	619	813	88	176	3.7
150 DTEJ–1400	150	619	813	88	176	16.9
200 DTEJ–240	200	698	892	106	212	1.8
200 DTEJ–700	200	698	892	106	212	6.8
200 DTEJ–1400	200	698	892	106	212	35
250 DTEJ–240	250	800	994	112	224	3
250 DTEJ–700	250	800	994	112	224	17
250 DTEJ–1400	250	800	994	112	224	40
300 DTEJ–240	300	800	994	115	230	7
300 DTEJ–700	300	800	994	115	230	22
300 DTEJ–1400	300	800	994	108	216	42
350 DTEJ–240	350	880	1080	127	254	8
350 DTEJ–700	350	880	1080	123	246	23
350 DTEJ–1400	350	880	1080	87	174	101
400 DTEJ–240	400	1105	1320	149	298	7
400 DTEJ–700	400	1105	1320	144	288	19
400 DTEJ–1400	400	1105	1320	100	200	73
450 DTEJ–240	450	1105	1320	163	326	7
450 DTEJ–700	450	1105	1320	146	292	24
450 DTEJ–1400	450	1105	1320	89	178	96
500 DTEJ–240	500	1225	1440	164	328	11
500 DTEJ–700	500	1225	1440	126	252	33
500DTEJ–1400	500	1225	1440	118	236	119
600 DTEJ–240	600	1435	1650	172	344	14
600 DTEJ–700	600	1435	1650	107	214	92
600 DTEJ–1400	600	1435	1650	101	202	184

*Non–concurrent

3.27 | Metallic Expansion Joint

Double Tied Expansion Joint (DTEJ)

The double tied expansion joint is well suited to allow lateral deflection in the low to medium pressure range. Used in this manner the tie rods will absorb the pressure thrust. The design may also be used to absorb axial movement but this would result in the pressure thrust being taken from the tie rods and transmitted to the anchors or adjacent equipment.

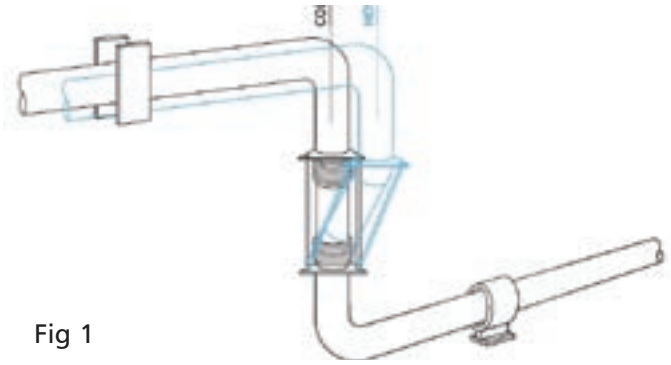


Fig 1

Fig 1 shows a double tied expansion joint used to absorb lateral deflection in a single plane. Wherever feasible the expansion joint should be designed to fill the entire leg so that the expansion of this leg is absorbed within the tie rods as axial movement.

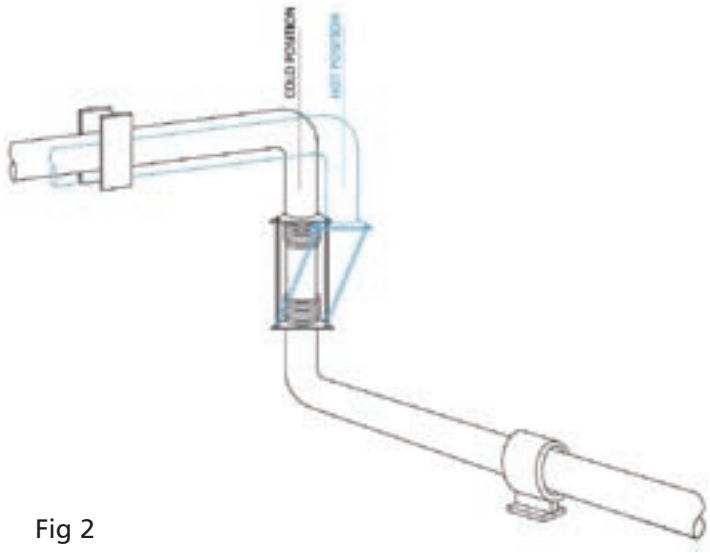


Fig 2

Fig 2 shows a double tied expansion joint used to absorb lateral deflection in a three–plane configuration. As the expansion joint will absorb lateral deflection in any direction, the two horizontal piping legs may lay at any angle in the horizontal plane.

To ensure that this style of joint is correctly installed without any thrust being transmitted to adjacent equipment, it may be necessary to utilize either double hinged or double gimbal expansion joints.

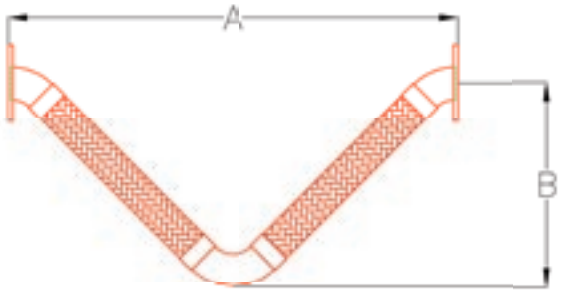
3.28 | Metallic Expansion Joint

Seismic Joints

Piping used in applications and locations subject to seismic conditions have their own set of unexpected random movements. The random motion common to earthquakes requires that seismic expansion joints to be capable of movement in any direction.

Significant cost and safety benefits found in PHF seismic expansion joints

- It is an inexpensive alternative to dual-tied bellows expansion joints and especially ball joints.
- During an earthquake, it protects equipment by allowing boilers, chillers, fan-coil units and other systems to move independently of the building.
- Installed at the connection, also prevents nozzles from cracking or shearing off.
- A break in the gas pipework could start a fire, which can of course be devastating. This Australian Gas Approval (AGA) - certified seismic expansion joint will compensate for the movement that occurs during any seismic activity such as an earthquake.
- It can also be designed with lined hose for high velocity, double-braid for high pressure applications. There are a wide range of end fittings and flanges available for assemblies.



V' Shape Seismic Joints

SIZE	Part No.#	DIM 'A' (mm)	DIM 'B' (mm)	MWP (kPa)	MOVEMENT X, Y & Z (mm)
32mm (1 1/4")	PHFVL-SS1O32-50-	510	270	3500	50
38mm (1 1/2")	PHFVL-SS1O38-50-	580	310	3000	50
50mm (2")	PHFVL-SS1O50-50-	660	360	2500	50
65mm (2 1/2")	PHFVL-SS1O65-50-	735	410	2000	50
75mm (3")	PHFVL-SS1O75-50-	820	470	2000	50
100mm (4')	PHFVL-SS1O100-50-	955	565	1600	50
125mm (5")	PHFVL-SS1O125-50-	1085	655	1506	50
150mm (6")	PHFVL-SS1O150-50-	1235	755	1506	50
32mm (1 1/4")	PHFVL-SS1O32-75-	590	310	3500	75
38mm (1 1/2")	PHFVL-SS1O38-75-	665	350	3000	75
50mm (2")	PHFVL-SS1O50-75-	750	405	2500	75
65mm (2 1/2")	PHFVL-SS1O65-75-	840	465	2000	75
75mm (3")	PHFVL-SS1O75-75-	940	530	2000	75
100mm (4')	PHFVL-SS1O100-75-	1085	625	1600	75
125mm (5")	PHFVL-SS1O125-75-	1230	725	1506	75
150mm (6")	PHFVL-SS1O150-75-	1395	840	1506	75
32mm (1 1/4")	PHFVL-SS1O32-100-	655	340	3500	100
38mm (1 1/2")	PHFVL-SS1O38-100-	745	390	3000	100
50mm (2")	PHFVL-SS1O50-100-	835	450	2500	100
65mm (2 1/2")	PHFVL-SS1O65-100-	925	505	2000	100
75mm (3")	PHFVL-SS1O75-100-	1040	580	2000	100
100mm (4')	PHFVL-SS1O100-100-	1195	685	1600	100
125mm (5")	PHFVL-SS1O125-100-	1350	785	1506	100
150mm (6")	PHFVL-SS1O150-100-	1530	905	1506	100
32mm (1 1/4")	PHFVL-SS1O32-150-	760	395	3500	150
38mm (1 1/2")	PHFVL-SS1O38-150-	865	450	3000	150
50mm (2")	PHFVL-SS1O50-150-	970	515	2500	150
65mm (2 1/2")	PHFVL-SS1O65-150-	1075	580	2000	150
75mm (3")	PHFVL-SS1O75-150-	1200	660	2000	150
100mm (4')	PHFVL-SS1O100-150-	1380	775	1600	150
125mm (5")	PHFVL-SS1O125-150-	1555	890	1506	150
150mm (6")	PHFVL-SS1O150-150-	1755	1020	1506	150

Table 2

Temp. (°C)	Corr. Factor
-200	1.0
-150	1.0
-100	1.0
-50	1.0
-0	1.0
20	1.0
50	0.95
100	0.83
150	0.75
200	0.69
250	0.65
300	0.61
350	0.58
400	0.56
450	0.54
500	0.53
550	0.52
600	0.34
650	0.19
700	0.10

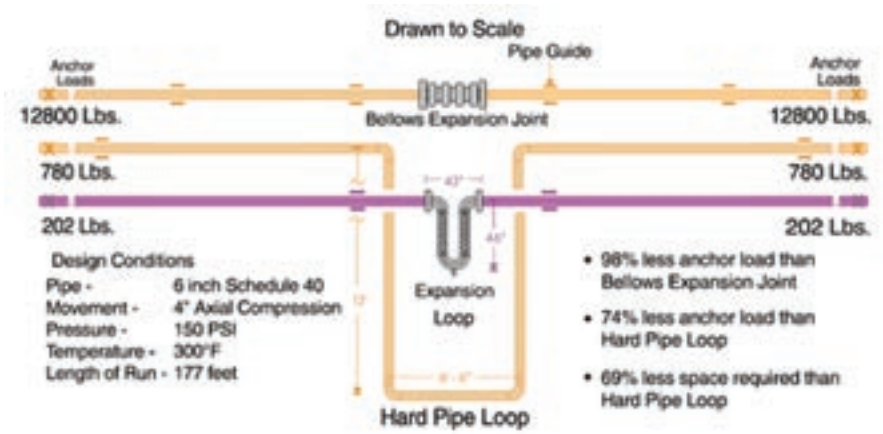
Note - Dimension 'A' and 'B' are approx dimensions only and are subject to change without notice.

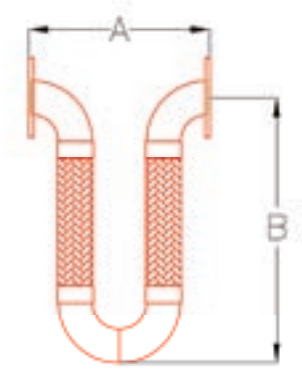
3.29 | Metallic Expansion Joint

Expansion Loops

Made of flexible stainless steel hose and braid, it accommodates lateral offset and angular movement. Pipes transporting hot or chilled water, steam and chemicals are all subject to varying internal temperatures, as well as significant thermal expansion.

Compared to conventional bellows type expansion joints and hard pipe loops, expansion loops exerts a fraction of the anchor load, requires far fewer pipe guides, and can take up less space, all significantly reducing overall project costs.





There's no limit to the thermal applications that the expansion loop can handle. It can also be designed with lined hose for high velocity, double-braid for high pressure applications. There are a wide range of end fittings and flanges available for assemblies.

U' Shape Expansion Joints

SIZE	Part No.#	DIM 'A' (mm)	DIM 'B' (mm)	MWP (kPa)	MVMT X, Y & Z (mm)
32mm (1 1/4")	PHFUL-SS1O32-50	230	385	3500	50
38mm (1 1/2")	PHFUL-SS1O38-50	260	445	3000	50
50mm (2")	PHFUL-SS1O50-50	315	525	2500	50
65mm (2 1/2")	PHFUL-SS1O65-50	390	600	2000	50
75mm (3")	PHFUL-SS1O75-50	470	690	2000	50
100mm (4')	PHFUL-SS1O100-50	620	835	1600	50
125mm (5")	PHFUL-SS1O125-50	775	980	1506	50
150mm (6")	PHFUL-SS1O150-50	925	1135	1506	50
32mm (1 1/4")	PHFUL-SS1O32-75	245	440	3500	75
38mm (1 1/2")	PHFUL-SS1O38-75	275	505	3000	75
50mm (2")	PHFUL-SS1O50-75	325	590	2500	75
65mm (2 1/2")	PHFUL-SS1O65-75	390	675	2000	75
75mm (3")	PHFUL-SS1O75-75	470	775	2000	75
100mm (4')	PHFUL-SS1O100-75	620	925	1600	75
125mm (5")	PHFUL-SS1O125-75	775	1080	1506	75
150mm (6")	PHFUL-SS1O150-75	925	1250	1506	75
32mm (1 1/4")	PHFUL-SS1O32-100	280	485	3500	100
38mm (1 1/2")	PHFUL-SS1O38-100	310	560	3000	100
50mm (2")	PHFUL-SS1O50-100	360	650	2500	100
65mm (2 1/2")	PHFUL-SS1O65-100	415	735	2000	100
75mm (3")	PHFUL-SS1O75-100	475	845	2000	100
100mm (4')	PHFUL-SS1O100-100	620	1005	1600	100
125mm (5")	PHFUL-SS1O125-100	775	1165	1506	100
150mm (6")	PHFUL-SS1O150-100	925	1345	1506	100
32mm (1 1/4")	PHFUL-SS1O32-150	330	560	3500	150
38mm (1 1/2")	PHFUL-SS1O38-150	360	645	3000	150
50mm (2")	PHFUL-SS1O50-150	410	745	2500	150
65mm (2 1/2")	PHFUL-SS1O65-150	465	840	2000	150
75mm (3")	PHFUL-SS1O75-150	525	960	2000	150
100mm (4')	PHFUL-SS1O100-150	620	1135	1600	150
125mm (5")	PHFUL-SS1O125-150	775	1310	1506	150
150mm (6")	PHFUL-SS1O150-150	925	1505	1506	150

Table 2

Temp. (°C)	Corr. Factor
-200	1.0
-150	1.0
-100	1.0
-50	1.0
-0	1.0
20	1.0
50	0.95
100	0.83
150	0.75
200	0.69
250	0.65
300	0.61
350	0.58
400	0.56
450	0.54
500	0.53
550	0.52
600	0.34
650	0.19
700	0.10

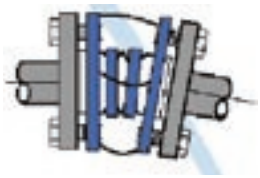
Note - Dimension 'A' and 'B' are approx dimensions only and are subject to change without notice.

3.30 | Teflon® Expansion Joint

Introduction

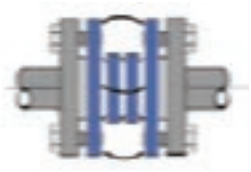
Pacific Hoseflex expansion joints are made of contour moulded PTFE (white or black), providing exceptional corrosion resistance and flex-life. The flexible liner is moulded over the metallic sealing face which eliminates troublesome separate gaskets and reduces the chances of bacteria build up. Different numbers of convolutions accommodate varying degrees of misalignment, axial travel and angular deflection between components.
They are corrosion proof and non-aging.

These expansion joints have found widespread acceptance in the chemical processing industry and commercial heating and air-conditioning systems as pump connectors and at strategic points throughout systems. Because of their established record of long service life, they are the most economical vibration and sound absorbers available.



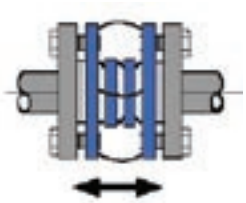
ANGULAR DEFLECTION

"Maximum Angular Deflection" may be called angular rotation. It is based on installation with no axial travel or lateral offset.



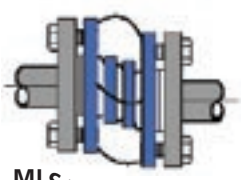
VIBRATION

In addition to noise, vibration transmitted through piping can cause leeks, premature equipment wear and cracked welds. Expansion joints drastically reduce vibration transmission, thereby solving many of these issues.



AXIAL TRAVEL

"Maximum Axial Travel" may be called longitudinal movement or axial compression and extension. It is based on installation with no misalignment or angular deflection.



MISALIGNMENT

"Maximum Misalignment" may also be referred to as lateral offset or deflection. It is based on installation with no axial travel or angular deflection.

They are manufactured with integral steel limit bolts and reinforcing rings enabling the bellow to absorb vibration and allow for thermal movement and misalignment in piping. They also provide resistance to rotational forces which can lead to joint failure, offering long life in coastal, marine, and chlorine rich environments.

They are available in 2, 3 and 5 Convolution models, with varying amounts of allowed movement.

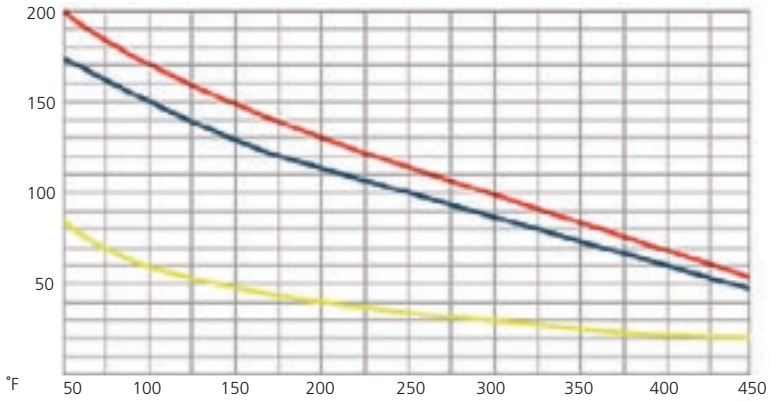
Teflon expansion joints are capable of handling all of the following movements:

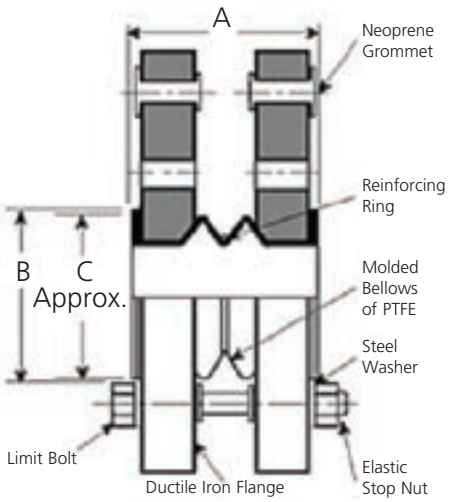
- Angular misalignment - called angular deflection and angular rotation, is the displacement of one flange in relation to the other causing them to lie in non-parallel planes.
- Vibration - Absorbing movement caused by generators or pumps that may result in pipe work cracking.
- Longitudinal - also called travel or axial compression and extension.
- Parallel misalignment - called offset or lateral deflection, is the displacement of one flange in relation to the other while they lie in parallel planes.
- Maximum travel is based on installation with no misalignment or angular deflection.
- Maximum Misalignment is based on installation with no Travel or Angular Deflection.
- Combined travel and misalignment are proportionately lower for each type of deflection according to the percentage of the "maximum" that is required for the other.

3.31 | Teflon® Expansion Joint

(PEJ2) 2-Convolute TEFLON® PTFE Expansion Joint

2-convolute expansion joints are contour moulded of TEFLON® PTFE by a patented process. They are corrosion resistant, non-ageing, with extraordinary flex life and reliability. The flexible element is formed over the full sealing face of the end flanges eliminating troublesome separate gaskets.





Size (I.D.) (in.)	A †		B	C	Maximum Misalignment *	Compression Force Spring Rate (lbf / in.)	Extension Force Spring Rate (lbf / in.)	Misalignment Force Spring Rate (lbf / in.)	Weight (lbs)	Vacuum Rating (in. Hg/°F)
	Neutral Length	Max. m Travel ±								
1	1 3/8	1/4	2	1 7/8	1/8	104	80	104	2	
1 1/2	1 3/8	1/4	2 7/8	2 27/64	1/8	320	180	224	3	
2	1 9/16	1/4	3 5/8	3	1/8	512	300	240	7	FV/450
2 1/2	2 1/4	5/16	4 1/8	3 1/2	1/8	457	278	328	10	
3	2 1/4	3/8	5	4 1/2	3/16	648	320	319	10	
4	2 5/8	1/2	6 3/16	5 1/2	1/4	480	280	400	18	
5	3 1/4	1/2	7 5/16	6 1/2	1/4	440	440	320	24	FV/400
6	2 3/4	1/2	8 1/2	8	1/4	440	386	440	29	
8	4	1/2	10 5/8	10 5/64	1/4	450	390	480	47	FV/250
10	5 1/4	1/2	12 3/4	11 3/4	1/4	760	600	580	64	
12	6	1/2	15	15	1/4	3300	420	700	115	FV/75

Diameters up to 24" are available on request.

All Dimensions in inches.
* At neutral length with limit bolts in place.
Maximum (axial) travel is based on installation with no misalignment or angular defection. 12" size supplied only with crest rings in stainless steel.
† This is an installation dimension not a limit bolt setting.

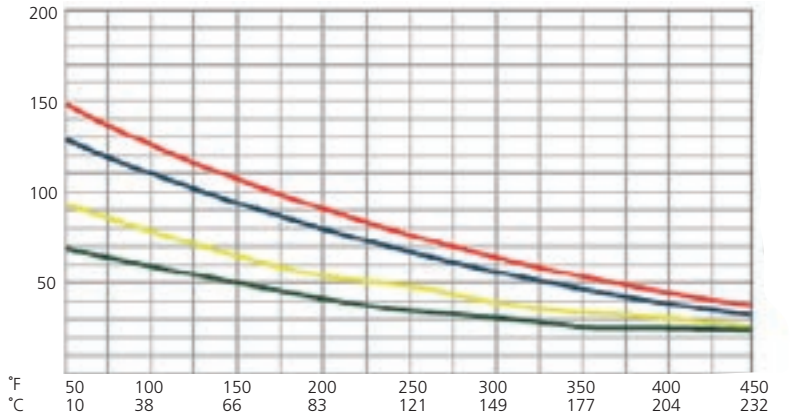
NOTE: Angular Deflection approx. 7°. Consult Factory for spring rates for angular deflection.

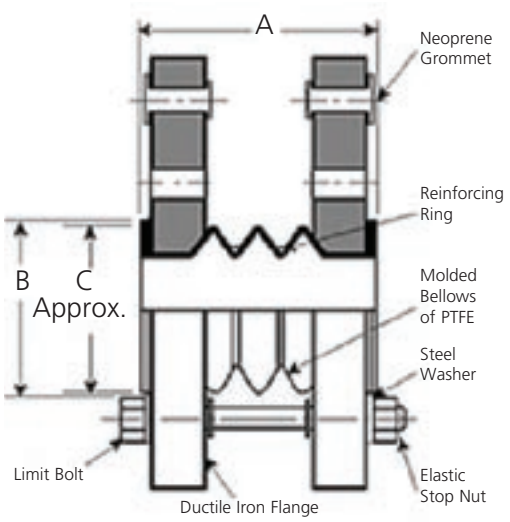
Flanges available in Carbon steel Zinc Chromate Plated, Ductile Iron and Stainless Steel

3.32 | Teflon® Expansion Joint

(PEJ3) Convolute TEFLON® PTFE Expansion Joints

3-Convolute expansion joints are contour moulded of TEFLON® PTFE by a patented process. They are corrosion resistant, nonageing, with extraordinary flex life and reliability. The flexible element is formed over the full sealing face of the end flanges eliminating troublesome separate gaskets.





Size (I.D.) (in.)	A †		B	C	Maximum Misalignment *	Compression Force Spring Rate (lbf / in.)	Extension Force Spring Rate (lbf / in.)	Misalignment Force Spring Rate (lbf / in.)	Weight (lbs)	Vacuum Rating (in. Hg/°F)
	Neutral Length	Max. Travel + Or -								
1	1 3/4	1/2	2	1 57/64	1/4	190	82	96	2	
1 1/2	2	1/2	2 7/8	2 35/64	1/4	84	66	108	4	
2	2 3/4	3/4	3 5/8	3 13/32	3/8	69	76	109	8	FV/400
2 1/2	3 3/16	3/4	4 1/8	3 13/16	3/8	91	97	160	11	
3	3 5/8	1	5	4 41/64	1/2	124	125	194	13	
4	3 5/8	1	6 3/16	5 11/16	1/2	220	155	264	19	
5	4	1	7 5/16	6 5/8	1/2	320	210	324	25	FV/300
6	4	1 1/8	8 1/2	8	9/16	289	187	266	30	
8	6	1 1/8	10 5/8	10 5/16	9/16	178	218	423	48	FV/125

Diameters up to 24" are available on request.

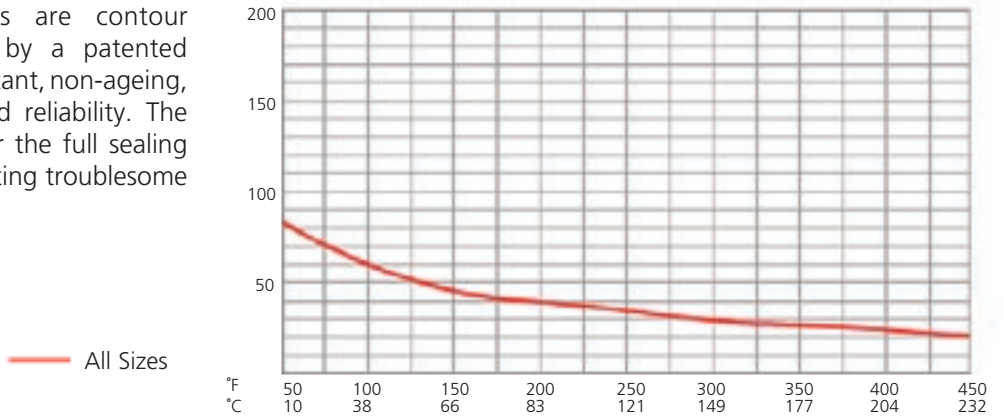
All Dimensions in inches.
* At neutral length with limit bolts in place. Maximum (axial) travel is based on installation with no misalignment or angular defection.
† This is an installation dimension not a limit bolt setting.
NOTE: Angular Deflection approx. 14°. Consult Factory for spring rates for angular deflection.

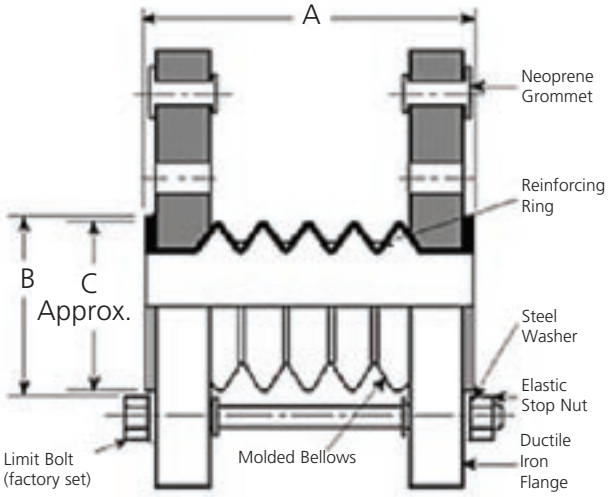
Flanges available in Carbon steel Zinc Chromate Plated, Ductile Iron and Stainless Steel

3.33 | Teflon® Expansion Joint

(PEJ5) Convolute TEFLON® PTFE Expansion Joints

5-convolute expansion joints are contour moulded of TEFLON® PTFE by a patented process. They are corrosion resistant, non-ageing, with extraordinary flex life and reliability. The flexible element is formed over the full sealing face of the end flanges eliminating troublesome separate gaskets.





Size (I.D.) (in.)	A †		B	C	Maximum Misalignment *	Compression Force Spring Rate (lbf / in.)	Extension Force Spring Rate (lbf / in.)	Misalignment Force Spring Rate (lbf / in.)	Weight (lbs)
	Neutral Length	Max. Travel + Or -							
1	3	1/2	2	1 57/64	1/2	30	44	22	2
1 1/2	3 1/2	3/4	2 7/8	2 35/64	1/2	75	83	46	5
2	4	1	3 5/8	3 13/32	1/2	60	47	50	9
3	5	1	5	4 41/64	1/2	55	60	170	14
4	5 1/4	1 1/4	6 3/16	5 11/16	5/8	72	60	80	20
6	6	1 1/4	8 1/2	8	5/8	190	130	195	31

All Dimensions in inches.
* At neutral length with limit bolts in place.
Maximum (axial) travel is based on installation with no misalignment or angular defection.
† This is an installation dimension not a limit bolt setting.

NOTE: Angular Deflection approx. 14°. Consult Factory for spring rates for angular deflection.

Flanges available in Carbon steel Zinc Chromate Plated, Ductile Iron and Stainless Steel

Rubber Expansion Joints (REJ)

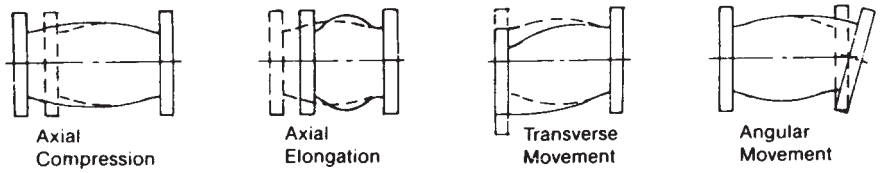
Rubber expansion bellows can be used for both suction and delivery (discharge) due to its excellent stability and pressure capacity. Rubber Expansion Joints are generally used as connectors between vessels operating at widely different temperatures ranging up to 115°C. Bursting pressure is above 550 psi and can be comfortably used within a normal internal pressure of approx 225 psi. The sizes range from 32 mm to 500 mm including a wide variety of different flanges and materials. Most common available materials are; EPDM ,Neoprene, Buna/Nitrile, Hypalon, Butyl and natural rubber.

Rubber expansion joints are generally used in heating and air conditioning systems, marine environments, sewage plants, industrial systems and for mild chemicals and oils. Rubber expansion joints permit the necessary motion and flexibility in a 'working' ship's piping system. The compactness, resilience and low stress features make them ideally suited for shipboard piping systems. Sewage treatment plants, water treatment plants and air scrubber systems all employ the use of general rubber expansion joints. Sludge pumps, raw and secondary sewage lines, centrifugal air blowers, scrub stacks use expansion joints due to their resistance to abrasion and corrosion as well as their flexibility make them well suited for these applications.

Nuclear and fossil fuel plants use rubber expansion joints to compensate for thermal expansion and contraction on condense lines, steam turbine exhaust lines, condensate lines, cooling water lines and aeration systems. They have been also successfully installed in demanding industrial ducting systems where flutter, heavy vibration, wet or dry corrosive materials are encountered. Rubber expansion joints reduce noise and vibration caused by forces in pumps or centrifuges by acting as a shock absorber in systems. Thermal movement is also an important consideration in a piping system, depending on the temperature change, length of pipe, thermal movement can easily be great enough to exceed the allowable pipe stress.

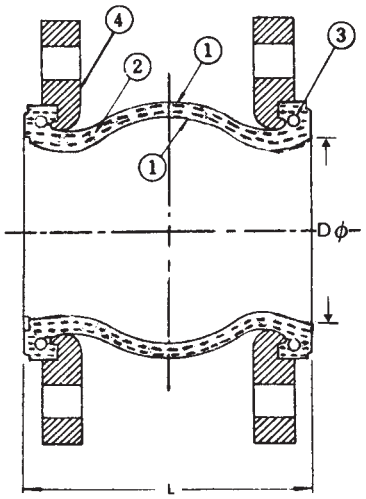
Rubber expansion joints are designed to alleviate piping stress, absorb pipe misalignment, compression and extension, noise and vibration, in a relatively short space. Standard stock items are the single arch and the twin-sphere joints. The spherical shape arch of the connector and excellent original structural design contribute to the great success of the joint. Combined with it's internally laid tough flexible fibres and it's moulding technique, rubber expansion joints have great ability to withstand the force of a creating vacuum. Internal reinforced rings can be inserted to increase the suction capabilities of the bellow.

MOVEMENT



Single Sphere Rubber Expansion Joint

STYLE 100



Press/Temp Correction Factor	Operating Temperatures					
	80°C	85°C	90°C	95°C	100°C	105°C
Maximum Working Pressure (x factor)	x1.0	x.92	x.83	x.75	x.67	x.60

Item	Part	Material
1	Body	Heat Resisting Rubber
2	Body	Nylon Tyre Cord
3	Wire	Hard Steel Wire
4	Flange	Mild Steel

Remarks

1. Application fluids:
   water, warm water, seawater, weak acids, alkalies, etc.

2. Available flanges drilling:
   JIS, DIN, ANSI, TAB / BS and specialised drilling.

3. Available material:
   EPDM, Neoprene, Buna/Nitrile, Viton, Hyperlon, Natural Rubber and Butyle.

Movement and Operating Condition

Diam. Do mm (in.)	L (mm)	Allowable Movement (mm)			Operating Condition			
		Axial Compression	Axial Elongation	Transverse Deflection	Angular Deflection	Maximum Pressure kg/cm² (PSIG)	Max. Temp °C °(F)	Vacuum Rating mm Hg (in.)
32 (1 ¼)	95	8	4	8	15°	16 (225)	115 (240)	400 (16)
40 (1 ½)	95	8	4	8	15°	16 (225)	115 (240)	400 (16)
50 (2)	105	8	5	8	15°	16 (225)	115 (240)	400 (16)
65 (2 ½)	115	12	6	10	15°	16 (225)	115 (240)	400 (16)
80 (3)	130	12	6	10	15°	16 (225)	115 (240)	400 (16)
100 (4)	135	18	10	12	15°	16 (225)	115 (240)	400 (16)
125 (5)	170	18	10	12	15°	16 (225)	115 (240)	400 (16)
150 (6)	180	18	10	12	15°	16 (225)	115 (240)	400 (16)
200 (8)	205	25	14	22	15°	16 (225)	115 (240)	400 (16)
250 (10)	240	25	14	22	15°	16 (225)	115 (240)	400 (16)
300 (12)	260	25	14	22	15°	16 (225)	115 (240)	400 (16)
350 (14)	265	25	16	22	15°	9 (125)	115 (240)	400 (16)
400 (16)	265	25	16	22	15°	9 (125)	115 (240)	400 (16)
450 (18)	265	25	16	22	15°	9 (125)	115 (240)	400 (16)
500 (20)	265	25	16	22	15°	9 (125)	115 (240)	400 (16)
600 (24)	265	25	14	22	15°	9 (125)	115 (240)	400 (16)

Twin Sphere Rubber Expansion Joints (TREJ)

Press/Temp Correction Factor	Operating Temperatures					
	80°C	85°C	90°C	95°C	100°C	105°C
Maximum Working Pressure (x factor)	x1.0	x.92	x.83	x.75	x.67	x.60

Remarks

1. Application fluids:
   water, warm water, seawater, weak acids, alkalis, etc.

2. Available flanges drilling:
   JIS, DIN, ANSI, TAB / BS and specialised drilling.

3. Available material:
   PDM, Neoprene, Buna/Nitrile, Viton, Hyperlon, Natural Rubber and Butyle.

Nominal Diameter		Face to Face	Temp (°C)	Travel mm Total Compressed Extended	Axial Compression	Allowable Movement (mm)			Pressure	
Inch	mm	Inch	Min-Max			Axial Extension	Lateral Deflection	Angular Deflection	Positive P.S.I.G. (Bar) at 80°C	Vacuum mm Hg
1-1/4"	32	7	-30 -110	125-205	53	27	45	40°	225(16)	660
1-1/2"	40	7	-30 -110	125-205	53	27	45	40°	225(16)	660
2"	50	7	-30 -110	125-205	53	27	45	40°	225(16)	660
2-1/2"	65	7	-30 -110	125-205	53	27	45	40°	225(16)	660
3"	80	7	-30 -110	125-205	53	27	45	40°	225(16)	660
4"	100	9	-30 -110	175-260	53	31	40	35°	225(16)	660
5"	125	9	-30 -110	175-260	53	31	40	35°	225(16)	660
6"	150	9	-30 -110	175-260	53	31	40	35°	225(16)	660
8"	200	13	-30 -110	265-360	65	30	35	30°	225(16)	660
10"	250	13	-30 -110	265-360	65	30	35	30°	225(16)	660
12"	300	13	-30 -110	265-360	38	30	35	30°	225(16)	660
14"	350	13.78	-30 -110	265-360	38	28	28	20°	150(10)	660
16"	400	13.78	-30 -110	265-360	38	28	28	20°	150(10)	660
18"	450	13.78	-30 -110	265-360	38	28	28	20°	150(10)	660
20"	500	13.78	-30 -110	265-360	38	28	28	20 °	150(10)	660

3.37 | Fabric Expansion Joints

Fabric Expansion Joints (FEJ)

To complete the entire expansion joint range Pacific Hoseflex provides a fabric expansion joint. Fabric expansion joints are widely used for a large number of industrial applications including:

- Power Plants
- Boiler Systems
- Flue Gas
- Nitrogen Oxide Reduction
- Gas Turbines
- Nuclear Power Plants
- Incinerator Plants
- Cement Industry
- Filter Systems
- Ventilators
- Ventilation Systems
- Dust Extraction Systems
- Offshore Installations
- Shipbuilding
- Chemical Industry

The temperature capabilities range from -50° C to +1000° C and the pressure range from -50 kPa to +50 kPa.

Functions

Fabric expansion joints are used for absorbing movements between joining connections in gas conveying ducts and pipe-lines. The movements can be caused by thermal expansion of the ducting system, wind conditions or vibrations from other system components or machines. In addition, fabric expansion joints can serve as seals and compensate for installation misalignments.

Advantages

The implementation of fabric expansion joints provides a number of advantages, which are technically and economically important:

- Extremely flexible absorbing large movements
- Absorbing different movements simultaneously
- Only requiring a limited building length
- Lightweight
- Easy to handle, store, install, repair and replace
- Does not transmit noise or vibrations.
- Reducing the necessary strength of fix-points and supports
- Non corroding
- Dimensionally stable
- Cost effective

Technical Information (Hose Specification Sheet)

Instructions: *To place an order or request a quotation, please complete section I. If you need assistance in specifying an assembly, complete Section II as well as the "End Fittings" portion of Section I. When completed, Fax: (617) 55 934 298 or Email: phf@hoseflex.com.au this form to Pacific Hoseflex.*

Customer: _____ **Contact**: _____ **Date:**_____

Phone:_____ **Fax:** _____ **Email:** _____

I. Specification Information

Request Quote Yes / No **circle one**

Place Order P.O.# _____ **Quote ref #**_____ **Quantity:** _____ **Date** _____
Required: _____ **Hose type:** _____ **Diameter** (mm)**:** _____ **Length** (mm):_____

(Live Length / Overall Length) Circle One

End Fittings **(type and size for both ends)**

End #1: Size: _____ Type: _____ Material: _____

End #2: Size: _____ Type: _____ Material: _____

Liner Required: Yes / No Circle One **If "Yes", Liner Material:** _____

Special Fabrication: _____

Accessories:_____

II. Application Information

Application Drawing: (sketch the installation and include all dimensions and motions of hose during application and any other considerations)

Size (mm)**:** _____ (in the event the fittings or hose have different sizes, include all sizes and show on the application drawing).

Temperature: Media: Min. ____°c Max. _____°c **Environment:** Min. ____°c Max. _____°c (assumption is 21°c for all)

Media:_____ (assumption is the media is compatible with all available materials)

Max. Pressure (psi)**:**_____ **Fluctuations** (None / Pulsating / Shock) Circle One (assumption is nominal pressure, no fluctuations)

Max. Velocity (feet/second)**:** _____ (assumption is velocity is too slow to affect performance)

Type of Motion (from drawing above)**:** (Static / Constant / Vibration) Circle One (assumption is static)

Type of Expansion: _____

Amount of Expansion of Motion: _____

Notes

Ratings-chemical effect

A - No effect - Excellent
B - Minor effect - Good
C - Moderate effect - Fair
D - Sever effect - Not recommended

Explanation of footnotes

1. **Satisfactory to 72°F**
2. **Satisfactory to 120°F**
3. **Satisfactory for O-rings**

	CPVC	Epoxy	Polypropylene	Polyethylene	PVC	Cyolac ® (ABS)	Phenolic	Nylon	Noryl ®	Delrin ® (Acetal)	Ryton ® to 200°F	Kynar ® (PVDDF)	Teflon ®	Stainless steel (316)	Stainless steel (304)	Stainless steel (440)	Titanium	Carpenter 20	Cast bronze	Cast iron	Aluminum	Hastelloy C	Carbron.ceramic	Caramagnet A	Viton ®	Buna N	Neoprene ®	Nitrile	Natural rubber	Hypalon ®	EPDM	Kel-F®	Tygon	Silicone	Ceramic	Carbon/graphite
Actadehyde	D	A	A	C	D	D	A	A		A[1]	A	D	A	A	A	-	A	-	A	C	B	A	A	-	D	D	C	D	C	C	A	A	D	A	A	A
Acetamide	-	A	A[1]	A	D	-	D	A		B[1]	A	C	A	A	B	-	-	-	D	D	-	-	-	-	B	A	B	A	D	B	A	A	D	B	A	A
Acetate Solvent	C	A	D	A	D	-	D	A	D		A	A	A	A	A	A	A	A	C	D	A	A	A	-	D	C	D	C	C	C	A	A	D	C	A	A
Acetic Acid, Glacial	C	B[1]	A[1]	A[2]	D	D	D	D	A	C	A	A[1]	A	A	C	D	A	A	C	D	A	A	A	-	D	C	D	C	B	C	B	A[2]	D	B	A	A
Acetic acid 20%	A	A	A	A	D	C	C	B	A	B	A	A	A	A	B	D	A	A	C	D	A	A	A	-	B	B	A	B	B	A	A	A	D	B	A	A
Acetic Acid 80%	C	C	A	A[2]	D	D	D	D	A	C	A	C	A	A	C	D	A	A	C	D	A	A	A	-	B	C[3]	C	C	B	C	A	A	D	B	A	A
Acetic Acid	C	C	B	A[2]	D	D	D	D	A	C	A	C	A	A	C	D	A	A	C	D	A	A	A	-	B	C[3]	C	C	B	C	A	A	D	C	A	A
Acetic Anhydride	D	A	B[1]	D	D	D	A	A[1]	D	D	A	B[1]	A	A	A	D	A	B	C	-	A[1]	A	A	-	D	D	A	D	B	A	B	A	D	C	A	A
Acetone	D	D	A	B[1]	D	D	A	A	D	C	A	D	A	A	A	B	A	A	A	A	A	A	A	A	D	D	C	D	C	B	A	A	D	B	A	A
Acetyl Chloride (dry)	C	A	-	D	C	D	-	D	D	D	A	A[2]	A	A	A	-	-	B	-	-	A	A	-	-	A	D	D	D	D	D	D	A	D	C	-	-
Acetylene	C	A	A[1]	A	A[1]	-	A	A	-	-	A	A	A	A	A	A	-	A	C	A	A	-	A	A	A	B	B	B	B	B	A	A	-	B	A	A
Acrylonitrile	A	A	A	A	-	D	D	A	-	-	-	A[1]	A	A[1]	A[1]	-	-	A[1]	-	A[1]	B[1]	B	A	A	D	D	C	D	D	C	D	-	-	D	A	B
Alcohol: Amyl	A[2]	D	B[1]	B[2]	A[2]	-	A	A[1]	C	A	A	A	A	A	A	-	B	A	A	-	B	A	A	-	B	B	A	B	B	A	A	A	B	D	A	A
Alcohol: Benzyl	A	A[1]	A	D	D	D	A	D	D	A	A	A	A	A[1]	A[1]	-	A	A	A	A	B[2]	A	A	-	A	D	C	D	D	B	B	A	B	-	A	-
Alcohol: Butyl	A[2]	A	A	A	A[2]	-	C	A	A	A	A	-	A	A	A	-	A	A	A	D	B	A	A	-	A	A	A	B	A	A	B	-	B	B	A	-
Alcohol: Diacetone	-	A	B[2]	B[1]	B[1]	-	A	A	A	A	-	A[1]	A	A	A	-	A	A	A	A	A[1]	A	A	-	D	D	D	D	D	D	A	-	-	D	A	A
Alcohol: Ethyl	A[1]	A[2]	A	B	C	B	A	A	A	B	-	-	A	A	A	A	A	A	A	A	B	A	A	A	A	C	A	C	A	A	A	-	C	B	A	-
Alcohol: Hexyl	-	A	-	A	A[2]	-	A	A	A	A	-	-	A	A	A	-	A	A	A	A	A	A	A	-	C	A	A	A	A	B	C	-	-	B	A	-
Alcohol: Isobutyl	-	A	A[1]	A[2]	A[1]	B	C	A[1]	A	A	-	-	A[2]	A	A	-	B	A	A	C	B	A	A	-	A	B	A	B	A	A	A	-	-	A	A	A
Alcohol: Isopropyl	A[2]	A	A[2]	A[2]	A[1]	-	A	B[1]	A[1]	A	-	-	A[2]	A	A	-	A	A	A	C	B	B	A	-	A	B	B	B	A	A	A	-	-	A	A	A
Alcohol: Methyl	A[1]	B[1]	A[2]	A[1]	B[1]	-	A	A	A[1]	C	A	A	A	A	A	B[1]	B	A	A	A	A[1]	A	A	A[1]	B[2]	A	A	A	A	A	A	A[1]	-	A	A	A
Alcohol: Octyl	-	A	-	A	C	B	A	A	A	A	-	-	-	A	A	-	A	A	A	A	A	C	A	-	B	B	B	B	B	B	A	-	-	B	A	-
Alcohol: Propyl	A[2]	A[1]	A	A[2]	A[2]	-	C	B	A[2]	A	A	A[2]	A	A	A	A	A	A	A	C	A	A	A	-	A	A	A	B[2]	A	A	A	-	-	A	A	A
Aluminum Choride 20%	A[1]	A[1]	A	B[2]	A[1]	B	D	D	A	C	A	A	A	C[1]	D	D	B	C[1]	D	D	D	A	A	-	A	A	A	A	A	B	A	A	B	B	A	A
Aluminum Choride	A[2]	A[1]	A	B[2]	A[1]	-	-	D	A	-	A	A	A	C[1]	A[1]	A[1]	B	B[1]	D	D	A[1]	A	A	-	A	A	A	A	A	B	A	A	B	B	A	A
Aluminum Fluoride	A[2]	B[1]	A	A[2]	A[2]	-	-	A[1]	A[1]	C	A	A	A	C[1]	B[1]	D	A	C[1]	-	-	B[1]	B	A	-	A	A	A	A	B	A	A	-	-	B	-	A
Aluminum Hydroxide	A	B[1]	A	A[2]	A[2]	-	D	A[1]	A	B	-	A	A	D[1]	A[1]	A[1]	B[1]	A[1]	C	A	B[1]	B	A	A	A	A	A	A[2]	D	A[2]	A	A[1]	-	-	A	A
Aluminum Potassium Sulfate 10%	A[2]	A[1]	A	A[2]	A[2]	-	-	D	A[2]	C	-	B[1]	A	B[2]	C	B[1]	A	A	-	D	C	C	A	-	A	A	A	A	A	A	A	A	B	A	A	A
Aluminum Potassium Sulfate 100%	A[2]	A[1]	A	A[2]	A[2]	-	-	D	A[2]	C	-	-	A	B[2]	C	D	A	B	-	D	C	C	A	-	A	A	A	A	A	A	A	A	B	A	A	A
Aluminum Sulfate	A[2]	A[1]	A	A[2]	A[2]	-	A	A[2]	A	C	A	A	A	B[1]	B	D	A	B	C	D	B[1]	B	A	-	A	A	A	A	A	A	A	A	B	A	A	A
Amines	D	A[1]	-	C[1]	D	-	D	D	D	D	B	-	A[2]	A	A	A	B	B	D	D	B	C	A	-	D	D	B	D	B	D	B	A	-	B	A	A
Ammonia 10%	A	A[1]	A[2]	C[1]	B[1]	-	A	A	A[1]	D	A[1]	A	A	A[1]	A[1]	A[1]	C	A[1]	D	A	A[1]	A	A	-	D	A	A	A	D	D	A	A	B	-	A	A
Ammonia, anhydrous	A	A	A	B[2]	A[2]	-	A	A[1]	B[1]	D	A[1]	A	A	A[1]	A	A	C	A	D	A	A[1]	B	C	-	D	B	C	B	D	D	A	A	A	D	A	A
Ammonia, liquid	A	A[1]	A[2]	C[1]	A[2]	-	A	B[1]	-	D	A[1]	A	A	A	B[2]	B[2]	C	B[2]	D	A	C	A	A	-	D	C	A	C	D	D	A	A	B	-	A	A
Ammonia, Nitrate	B	A	A	-	B[1]	-	A	D	A	C	A	A	A	A	A	A	-	A	D	A	C	-	A	-	D	C	C	C	-	D	A	-	B	-	A	-
Ammonium Bilfuoride	A	A[1]	A	A[2]	A[2]	-	A	-	A	D	-	A	A	-	C	-	-	B	D	D	B	B	-	-	A	A	A	A[2]	-	-	A[2]	-	-	-	A	A
Ammonium Carbonate	A	A[1]	A	B[2]	A[2]	-	D	A	A[2]	D	A	A	A	B	B	B	A	B	D	A	B	B	A	-	-	D	A	B	A	-	A	-	B	-	A	A
Ammonium Casenite	-	A	-	-	-	-	D	-	A	D	-	-	-	A	-	-	-	-	-	-	-	-	-	-	-	-	A	-	-	-	-	-	-	-	-	-
Ammonium Chloride	A[2]	A[1]	A[2]	A[2]	A[2]	-	A	C	A	B	A	A	A	D[1]	C	C	B	B	D	D	C	A	A	-	A	B	A	B	A	A	A	A	B	-	A	A
Ammonium Hydroxide	A	A[1]	A	A[1]	A	B	A	A	A	C[1]	A	A	A	A[1]	A[1]	B	A	A	A	A	B[2]	B	A	-	B	D	A	D	D	A	A	A	B	A	A	A	A
Ammonium Nitrate	A[2]	A[1]	A	A	A[2]	-	D	B	A	C	A	A	A	A	A[1]	A[1]	A	A	D	A	B[1]	B	A	-	A	A	B	A	C	A	A	A	B	-	A	A
Ammonium Oxalate	-	A	-	-	A	-	D	-	-	B	-	-	-	A	A	A	-	A	D	D	-	A	A	-	-	A	A	-	-	-	-	-	-	-	-	-
Ammonium Persulfate	A	A[1]	A	A[2]	A[2]	-	C	C[1]	A[1]	D	-	A[1]	A[1]	B	A	A	A	B	D	D	D	B	A	-	A	D	A	D	A	A	A	A	-	A	A	A
Ammonium Phosphate, Dibasic	A	A[1]	A	A[2]	A[2]	-	A	C[1]	A	B	-	A	A[2]	B	B	B	A	A[1]	C	C	B[1]	B	A	-	A	A	A	A	A	A	A	A	-	A	A	A
Ammonium Phosphate, Monobasic	A	A	A	A	A	-	A	B	A	B	-	-	A	C[1]	B	B	A	C[1]	D	D	B	B	A	-	A	A	A	A	A	A	A	-	-	A	A	-
Ammonium Phosphate, Tribasic	A	A	A	C	A	-	A	B	A	B	-	-	A	B	B	B	A	-	C	A	B	B	A	-	A	A	A	A	A	A	A	-	-	A	A	-
Ammonium Sulfate	A	A[1]	A	A[1]	A[2]	-	A	A[1]	A	-	A	A	A	B	B	B	A	B	D	C	A[1]	B	A	-	A	A	A	A	A	A	A	A	-	A	A	A
Ammonium Thiosulfate	-	A	-	A	-	-	A	-	-	B	-	-	-	A	-	-	A	-	D	D	-	-	A	-	-	A	A	A	-	-	-	-	-	-	A	-
Amyl Acetate	C[1]	A[1]	B[1]	C[1]	C[1]	-	D	C[2]	D	A	A	A[2]	A	A	A[1]	B	A	A	C	C	A	A	A	-	D	D	D	D	D	D	A	A[1]	D	D	A	A
Amyl Alohol	A[2]	D	B[1]	B[2]	A[2]	-	A	A[1]	C	A	A	A	A	A	A	-	B	A	A	-	B	A	A	-	B	B	A	B	B	A	A	A	B	D	A	A
Amyl Chloride	C	A[1]	D	D	D	-	-	C[1]	D	A	-	A	A	A[2]	A[2]	C[1]	C	A[2]	A	-	A[1]	A[1]	A	-	B[1]	-	D	B[1]	D	D	D	A	C	D	A	A
Aniline	C[1]	C[1]	C[1]	B[2]	C[1]	D	D	C[1]	D	A[1]	A	A[1]	A	B	A	B	C	A	C	C	C	B	A	-	C	D	D	D	D	D	B	A[2]	D	D	A	A
Anti-Freeze	A	A	D	-	A	B	A	D	A	D	-	-	-	A	-	-	-	A	A	A	A	-	A	-	A	A	C	C	A	-	-	-	B	-	A	-
Antimony Trichloride	A[2]	-	A	B[2]	A[2]	-	-	D	A[2]	-	-	A	A	C[1]	D	D	B	B	-	-	D	-	-	-	A[2]	-	-	-	-	-	B[1]	A	-	-	-	-
Aqua Regia (80%HCl,20%HNO3)	C[1]	D	B[1]	B[1]	C[1]	-	D	D	D	D	D	A[1]	A	D[1]	D	-	A	D	D	-	D	C	-	-	B	D	C	D	D	C	C	A	D	D	D	D
Arochlor 1248	-	A[1]	D	C[1]	-	-	-	A[1]	-	-	-	-	A	B	B	-	A[1]	-	-	-	A	A	-	-	A	C	D	C	D	D	B	A[1]	-	B	-	-
Aromatic hydrocabrons	D	A	D	C	D	-	A	-	D	A	-	-	-	C[1]	-	-	-	-	C	A	A	-	A	-	A	C	D	C	D	D	D	-	-	D	-	-
Arsenic Acid	A[1]	A[1]	A	B[2]	A[1]	-	A	C[1]	A[1]	D	A	A	A	A[2]	A[2]	B	B	A[1]	D	D	D	B	A	-	A[2]	A[2]	A	A[2]	B	A	A[2]	-	B	A	A	A	A
Asphalt	A[2]	A	B[1]	A[1]	A[2]	-	D	A	-	A	A	-	A[1]	A	B	B	-	A	A	A	A	-	-	A	A	B	C	B	D	D	D	A	-	D	A	A
Barium Carbonate	A[2]	A[1]	A	B[2]	A[2]	-	-	A[1]	A[2]	A	-	A	A	B	B[1]	B[1]	A	B	B	-	D	B	A	A	A	A[2]	-	A[2]	-	-	A	A	-	-	A	A

Derlin,Hypolon,Neoprene,Teflon,Biton-Reg TM E.I. du Pont de Nemours & Co
KelF-Reg TM Minnesota Mining & Mfg. Co

Ryton-Reg TM Phillips Petrolum Co
Tygon-Reg TM Norton Co
Noryl-Reg TM General Electric Co

Kynar-Reg TM Penwalt Corp
Cycolac-Reg TM Mar-Bon Corp

MATERIAL COMPATIBILITY

3.41 | Guide Only

Ratings-chemical effect

A - No effect - Excellent
B - Minor effect - Good
C - Moderate effect - Fair
D - Sever effect - Not recommended

Explanation of footnotes

1. **Satisfactory to 72°F**
2. **Satisfactory to 120°F**
3. **Satisfactory for O-rings**

	CPVC	Epoxy	Polypropylene	Polyethylene	PVC	Cyolac ® (ABS)	Phenolic	Nylon	Noryl ®	Delrin ® (Acetal)	Ryton ® to 200°F	Kynar ® (PVDDF)	Teflon ®	Stainless steel (316)	Stainless steel (304)	Stainless steel (440)	Titanium	Carpenter 20	Cast bronze	Cast iron	Aluminum	Hastelloy C	Carbron.ceramic	Caramagnet A	Viton ®	Buna N	Neoprene ®	Nitrile	Natural rubber	Hypalon ®	EPDM	Kel-F®	Tygon	Silicone	Ceramic	Carbon/graphite
Barium Chloride	A[1]	A[1]	A	A[1]	A[1]	-	A	A[2]	A	A	A	A	A	A[1]	A[1]	B	A	B	C	C	D	B	A	-	A	A	A	A[2]	A	A	A	A	B	A	A	A
Barium Cyanide	D	A[1]	D	B	D	-	-	-	-	B	-	-	A[1]	A[1]	A[1]	-	-	A[1]	C	-	C[1]	-	A	-	A	C	A	C	-	-	A	-	-	-	-	-
Barium Hydroxide	A[1]	A[1]	B	B[2]	A[2]	-	A	A[1]	A[2]	D	A	A	A	B	B[1]	B[1]	B	B[1]	A	A	D	B	A	A	A	A	A	A[2]	A	A	A	A	-	A	A	A
Barium Nitrate	A	A[1]	A	B[2]	A	-	D	A[1]	A	A	-	-	A[1]	B	B[1]	B	A	B	D	A	B	-	A	-	A	A[2]	A	A[2]	-	-	A	A	-	-	A	A
Barium Sulfate	B[1]	C[1]	B[1]	B[2]	B[1]	-	-	A[1]	A[1]	A	A	A	A	B[1]	B[1]	B	B	B	C	-	B	A	A	-	A	A	A	A	A	A	A	A	-	A	B	A
Barium Sufide	A[2]	B[1]	B	B[2]	A[2]	-	-	A[1]	A[2]	A	-	A	A	B[2]	B[1]	B[1]	A	A[1]	C	-	D	-	A	-	A	A	A	A	A	A	A	A	-	-	A	A
Beer	A[1]	A[1]	A[1]	A[2]	A[1]	-	A	A[1]	A[1]	B	-	A	A	A	A[1]	A[1]	B	A	A	D	A	A[1]	A	-	A	A	A	A	A	A	A	A	C	A	A	A
Beer Sugar Liquids	A[2]	A[1]	B[1]	A[1]	A[2]	B	A	A	A	B	-	-	A[1]	A	A[1]	B	A	A	C	A	A	-	A	-	A	A	A	A	A	A	A	A	-	A	A	A
Benzaldehyde	D	A[1]	A[1]	A[1]	D	B	D	C[1]	D	A	A	A[2]	A[1]	B	B	-	A	A	A	A	B	A	A	-	D	D	D	D	D	D	A	A	D	D	A	A
Benzene	C[1]	C[1]	C[1]	C[1]	C[1]	D	A	A	D	A[1]	A	A[2]	A	B	B	B	A	A	A	A	B	B	A	A	A	D	D	D	D	D	D	B	C	D	A	-
Benzoic Acid	A	A[1]	C[1]	B[2]	A	-	C	C[1]	A[1]	B	A	A	A[2]	B	B	B	B	B	D	D	B	B[1]	A	-	A	D	D	D	D	D	D	A	B	B	B	D
Benzol	-	A[1]	A	C[1]	-	-	A	D	D	A	A	A	A	A[1]	A[1]	-	-	B	A	A	B[1]	B	A	A	A	D	B	D	D	B	B	A	-	-	A	A
Borax (Sodium Borate)	A	A[1]	B	A[2]	B[1]	-	D	A	A[1]	A	A	A	A	A	A	A	B	A	A	A	B[1]	B	A	A	A	D	D	D	D	A	A	A	-	B	A	A
Boric Acid	A	A[1]	A	A[2]	A[2]	-	A	B	A[1]	A	A	A	A	A[1]	B[2]	B	A	B[2]	B	D	D	A	A	A	A	A	A	A	A	A	A	A	B	A	B	A
Brewery Slop	-	A	-	-	-	-	A	-	-	A	-	-	-	A	-	-	-	A	A	A	-	-	A	-	A	A	A	A	-	-	-	-	-	-	A	-
Bromine	D	D	D	D	C[1]	D	D	D	A[1]	D	D	A	A	D	D	D	D	D	D	-	D	A	D	D	A	D	D	D	D	D	D	A	B	D	A	D
Butadiene	A	A[1]	D	D	C[1]	-		A[1]	-	A	A[1]	A	A[2]	A	A	A	-	A	C	-	A		A	-	B	D	B	D	D	B	C	A	-	D	A	A
Butane	C[1]	A[1]	C[1]	C[1]	C[1]	B		A[2]	D	A	A	A	A	A[2]	A[2]	A	A	A	C		A	A	A	-	A	A	A	A	D	B	D	A	C	D	A	A
Butanol (Butyl Alcohol)	A	D	A[1]	A[2]	B[1]	-	A	B[1]	A	A	A	A	A[2]	A[1]	A	A	B	A	A	-	B	A	A	-	A	A	A	A	A	A	B	A[1]	B	B	A	A
Butter	-	A	-	-	-	B	D	-	B	A	-	-	A	A	C	-	-	-	D	D	A		A	-	A	A	B	A	D	B	A	-	B	B	A	-
Buttermilk	A[1]	A[1]	A[1]	A[1]	A[1]	B	D	B[1]	A	A	-	-	A	A	A	A	-	-	D	D	A	A	A	-	A	A	A	A	D	-	-	A	B	-	A	A
Butylene	A[1]	A[1]	-	B[1]	C[1]	-	A	B[1]	-	A	A	A	A	A	A	A	-	A	D	-	A	-	A	-	A	B	C	B	D	D	D	B[1]		D	A	A
Butylacetate	C[1]	B[1]	B[1]	C[1]	D	-	D	A	D	A	A	B[2]	A	A	B	B	A	B[1]	A	A	B	A	A	-	D	D	D	D	D	D	B	A[1]	D	D	A	A
Butyric Acid	A	C[1]	C[1]	D	B[1]	D	D	B[1]	A[1]	C	A	B	A[2]	B[2]	B[2]	C[2]	A	B	A	D	B	A[1]	A	-	B[1]	D	D	D	-	D	B	A	C	-	-	-
Calcium Bisufate	-	A[1]	-	-	-	-	D	-	-	-	-	-	-	A	-	-	-	-	C	D	-	-	-	-	-	-	A	-	-	-	-	-	-	-	A	A
Calcium Bislfide	A[1]	A	A	-	A[2]	-	-	A	A	D	-	-	A	B	B	-	A	B	C	-	C	-	A	-	A	A[1]	A	A[1]	-	-	C	A	-	-	A	A
Calcium Bisulfite	B[1]	A	B	A[1]	B[1]	-	-	A[2]	A[1]	D	A	A	A	A	B	D	A	B[1]	-	-	D	B	-	-	A	A[1]	A	A	D	A	D	A	-	A	A	A
Calcium Carbonate	A	A[1]	A	B[2]	A[2]	-	-	A	A[2]	A	-	A	A	B	A[1]	A	B	B[1]	A	-	D	B	A	-	A	A[1]	A	A	A	A	A	-	-	A	A	A
Calcium Chlorate	A	-	-	-	A[2]	-	A	-	-	-	-	-	A	-	-	-	-	-	-	-	-	-	-	-	A	C	-	C	-	-	A	-	-	-	-	-
Calcium Chloride	A[2]	A[1]	A[2]	B[2]	A[2]	B	A	A[1]	A	D	A	A	A	B[2]	C[2]	C[1]	A	B	A	C	D	A	A	B	A	A	A	A	A	A	A	A	-	A	A	A
Calcium Hydroxide	A[2]	A[1]	A[2]	B[2]	A[2]	-	D	A[2]	A[2]	D		A	A	B	C	C	A	B	D	A	C[1]	A	A	A	A	A	A	A	A	A	A	A	-	A	A	A
Calcium Hypochlorite	B[1]	A[1]	A[2]	B[2]	B[1]	-	A	C[1]	A	D	A	A	A	B	C[1]	D	A[1]	B	D	D	D	B	A	-	A	C[1]	C	C[1]	D	A	B[1]	B[1]	A	B	A	A
Calcium Sulfate	A[2]	A[1]	A[2]	B[2]	A[2]	C	D	D	A	D	A	A	A	B	B	A	B	A	A	A	C	B	A	-	A	A[2]	C	A[2]	-	-	A	A	-	-	A	A
Calgon	-	A	A	-	-	-	D	A	A	B	-	-	-	A	A	-	-	-	C	D	-	-	A	-	A	A	A	A	-	-	A	-	-	-	A	-
Cane Juice	A[2]	A	C[1]	-	A[2]	-	A	A	-	A	-	-	A	A	A	-	-	A	A	A	B	-	A	-	A	A	A	A	A	A	A	-	A	-	A	-
Carbolic Acid (See Phenol)	A	C[1]	B[2]	B[1]	C	-	D	D	D	D	A	A[2]	A	B	B	B	A	B	A	D	B	A	A	A	A	D	C	D	D	C	B	A[1]	C	D	D	A
Carbon Bisufide	A	A	C[1]	-	D	-	-	A	-	A	-	-	-	B	A	A	-	B	B	-	B	-	A	A	A	C	D	C	-	D	D	-	D	-	A	-
Carbon Dioxide	A	A[1]	A[2]	C[1]	A	B	A	A[1]	A[1]	A	A	A	A	A[1]	A	A	A	A	A	D	B	A	A	-	B	A	B	A	B	B	B	A	-	B	A	A
Carbon Dioxide (Dry)	A	A[1]	A[2]	C[1]	A	B	A	A[2]	A[1]	A	A	A	A	A[1]	A	A	A	A	A	D	B	A	A	-	B	A	B	A	B	B	B	A	-	B	A	A
Carbon Dioxide (Wet)	A	A[1]	A[2]	C[1]	A	B	A	A[2]	A[1]	A	A	A	A	A[1]	A	A	A	A	A	D	B	A	A	-	B	A	B	A	B	B	B	A	-	B	A	A
Carbon Disufide	C[1]	C[1]	D	C[1]	D	-	A	B[1]	A[1]	A[1]	A	B[2]	A	B	A[1]	B	B	B	D	A	A	B	A	-	A[1]	D	D	D	D	D	D	A	-	-	B	A
Carbon Monoxide	A[2]	A[1]	A	B[2]	A[2]	-	A	A	A[2]	A	-	B	A	A	A	A	-	A	C	D	A	A	A	-	A	A	A	A	B	A	A	-	-	A	A	A
Carbon Tetrahloride	C[1]	A[1]	B[1]	B[1]	B[1]	D	A	D	D	B[1]	A	A	A	B	B	B	A	B	A	C	D	A[1]	A	A	A	C	D	C	D	D	D	A[1]	C	D	A	A
Carbonated Water	A	A	B	A	A	-	-	A	A	A	-	-	-	A	A	A	-	A	C	D	A	-	A	-	A	A	A	A	-	-	-	-	-	-	A	-
Carbonic Acid	A	B[1]	B	B[2]	A[2]	-	A	A[1]	A[1]	B[1]	A	A[1]	A	A	A[1]	B	B[1]	A	A	D	B[1]	A[1]	A	-	A	B	A	B	A	A	A	A	-	A	A	A	A
Catsup	A	A[1]	A	-	A	B	D	A	A	B	-	-	-	A	A	A	-	A	D	D	D	-	A	-	A	A	C	A	-	-	C	-	-	-	A	-
Chloroacetic Acid	B[1]	C[1]	C[1]	C[1]	B[1]	-	-	D	-	D	A	A[1]	A	A[1]	B[1]	D	A[1]	C[2]	-	-	D	B	A	-	D	B	D	B	D		B	A[2]	D	-	-	A
Chloric Acid	A	-	-	-	A[2]	-	-	D	D	D	-	-	A	C	D	D	-	A	-	-	D	A	-	-	-	-	-	-	-	-	-	A	-	-	-	D
Chlorinated Glue	-	A	-	-	-	-	D	-	-	-	-	-	-	A	-	-	-	-	A	D	-	-	-	-	A	C	D	C	-	-	B	-	-	-	-	-
Chlorine, anthydrous liquid	B[2]	C[1]	B	B[2]	C[1]	-	D	D	B[1]	A[1]	D	B	A	C	C[1]	D	B	C	D	C	D	B	A	-	A	D	D	D	D	C	C	B[2]	C	-	D	A
Chlorine, dry	A[2]	-	C[1]	B	A[2]	-	-	D	B[1]	D	D	A	A	B	C[1]	C	D	A	-	-	C[1]	B	-	-	A	D	C	D	D	B	A	D	-	D	-	A
Chlorine Water	A[2]	A[1]	C[1]	B[1]	A[2]	-	-	C[1]	C[1]	D	D	B	A	C	C	D	A	B	-	-	D	A	-	-	A	D	D	D	D	C	C	A	-	-	-	A
Chlorobenzene (Mono)	D	C[1]	C[1]	C[1]	D	D	D	B	D	A[1]	A	A	B	B	A	B	B	B	A	D	A	B	A	-	A	D	D	D	D	D	D	A[1]	A	D	A	A
Chloroform	D	C[1]	C[1]	C[1]	D	D	A	D	D	B[1]	A	A	A[1]	A	B[1]	A	A[2]	A	D	D	B[1]	A[1]	A	A	A	D	D	D	D	D	D	B[1]	A	D	A	A
Chlorosulfonic Acid	C[1]	C[1]	D	D	C	-	D	D	D	D	D	C[1]	A	B[2]	D	D	A	C	D	D	C[2]	A[1]	-	-	C	D	D	D	D	D	D	A[2]	C	D	C	A
Chocolate Syrup	-	A	A	-	-	-	D	A	A	A	-	-	A	A	A	-	-	C	D	D	A	-	-	-	A	A	A	A	D	-	-	-	-	-	A	-
Chromic Acid 5%	A	B[1]	A	B	A	B	C	D	A[1]	B[1]	A	A	A	A	B	B[1]	A	B[1]	D	D	C	B	D	-	A	D	D	D	B	B	A	A	B	C	C	A
Chromic Acid 10%	A[2]	C[1]	A	A[2]	A[2]	B	D	D	A[1]	B[1]	A	A	A	B	B	B[1]	B	B[1]	D	D	D	B	D	-	B	D	D	D	D	B	C	A	C	C	C	A
Chromic Acid 30%	B[2]	C[1]	A[2]	A[2]	B[2]	C	C	D	D	C	B	A[2]	A	B[2]	B[1]	C	A	B[2]	D	D	D	B	D	-	A	D	D	D	D	B	B	A	B	C	D	A
Chromic Acid 50%	C[2]	D	B[1]	A[2]	C[2]	C	C	D	D	D	A[1]	A[2]	A	B[2]	C[2]	D	A[2]	C[1]	D	D	D	B[1]	D	-	A	D	D	D	D	B	B	A[2]	B	C	D	A[1]

Derlin,Hypolon,Neoprene,Teflon,Biton-Reg TM E.I. du Pont de Nemours & Co
KelF-Reg TM Minnesota Mining & Mfg. Co

Ryton-Reg TM Phillips Petrolum Co
Tygon-Reg TM Norton Co
Noryl-Reg TM General Electric Co

Kynar-Reg TM Penwalt Corp
Cycolac-Reg TM Mar-Bon Corp

MATERIAL COMPATIBILITY

3.42 | Guide Only

Ratings-chemical effect

- **A - No effect - Excellent**
- **B - Minor effect - Good**
- **C - Moderate effect - Fair**
- **D - Sever effect - Not recommended**

Explanation of footnotes

1. **Satisfactory to 72°F**
2. **Satisfactory to 120°F**
3. **Satisfactory for O-rings**

	CPVC	Epoxy	Polypropylene	Polyethylene	PVC	Cyolac ® (ABS)	Phenolic	Nylon	Noryl ®	Delrin ® (Acetal)	Ryton ® to 200°F	Kynar ® (PVDDF)	Teflon ®	Stainless steel (316)	Stainless steel (304)	Stainless steel (440)	Titanium	Carpenter 20	Cast bronze	Cast iron	Aluminum	Hastelloy C	Carbron.ceramic	Caramagnet A	Viton ®	Buna N	Neoprene ®	Nitrile	Natural rubber	Hypalon ®	EPDM	Kel-F®	Tygon	Silicone	Ceramic	Carbon/graphite
Cider	-	A	A	B	A	-	D	-	A	B	-	-	-	A	A	A	-	A	A	D	B	-	A	-	A	A	A	A	-	-	-	-	-	-	A	-
Citric Acid	B[2]	A[1]	A	A[1]	B[2]	C	A	A[1]	A[1]	B[1]	A	A	A	A[2]	B[2]	C[2]	A[2]	A[2]	C	D	C	A	A	B	A	A	A	A	A	A	A	A[2]		A	A	A
Citric Oils	-	A	A	-	-	-	D	-	A	B	-	-	-	A	A	-	-	A	D	D	C	-	A	-	A	A	D	A	-	-	-	-	-	-	A	-
Clorox (Bleach)	A	A	D	-	A	B	D	A	A	D	C	-	A	A	A	-	-	-	D	D	A	A	A	-	A	B	B	B	D	B	B	D	B	-	A	-
Coffee	A	A	A	-	-	-	-	A	A	A	-	-	-	A	A	A	A	A	D	-	A	A	A	-	A	A	A	A	A	A	A	-	-	A	A	-
Copper Chloride	A	A	A	B	A	-	D	A	A	B	A	-	A	D	D	B	A	B	D	D	D	-	-	-	A	A	A	A	A	A	A	-	B	A	A	-
Copper Cyanide	A	B[1]	A	B[2]	A[2]	-	A	A[1]	A[1]	B	A	A	A	B	B	B	B	B	C	D	D	B	A	-	A	A	A	A	A	A	A	-	-	A	A	A
Copper Fluoborate	-	A	-	-	A	-	A	-	-	B	-	-	-	D	D	-	-	-	D	D	-	B	A	-	A	B	A	B	-	-	-	-	-	-	-	-
Copper Nitrate	A	A[1]	A	B[2]	B[2]	-	-	D	A[1]	D	A	A	A	B	A	B	B	B	D	-	D	A[1]	A	-	A	A	A	A	-	-	-	A	-	-	A	A
Copper Sulfate 5%	A	A[1]	A	B[2]	A[2]	-	A	C[2]	A[1]	D	A	A	A	B	B	B	A	B	C	D	D	A	A	-	A	A	A	A	B	A	A	A	-	A	A	A
Copper Sulfate >5%	A	A[1]	A	B[2]	A[2]	-	A	C[2]	A[1]	D	A	A	A	B	B	B	A	B	C	D	D	A	A	-	A	A	A	A	B	A	A	A	-	A	A	A
Cream	A	A	A	-	-	-	A	A	A	A	-	-	A	A	A	-	-	A	D	D	A	-	A	-	A	A	C	A	-	-	-	-	-	-	A	
Cresols	D	A[1]	D	C[1]	D	D	D	D	D	D	A	A[2]		A	A[2]	-	B	A	C	C	A	B[2]	A	-	A	D	D	D	D	D	D	A[1]	D	D	A	A
Cresylic Acid	A	A[1]	D	B[1]	C[1]	-	D	D	-	D	-	B[1]	A	A	A[1]	A[1]	A[1]	A[1]	C	C	B	B[1]	A	-	A	D	D	D	D	D	D	-	-	D	A	A
Cyanic Acid	-	A[1]	-	-	-	-	D	-	-	D	-	-	A	A	A	-	-	-	D	D	-	-	-	-	A	C	C	C	-	-	-	-	-	-	-	A
Cyclohexane	B[1]	A[1]	C[1]	B[1]	D	-	D	A	D	A[1]	A	A	A	A	A	-	A	A	D	A	A	B	A	-	A	A	D	A	D	D	D	A	D	D	A	A
Detergents	A	A[1]	B[1]	A[1]	A	B	-	A[1]	A[1]	A[1]	A	-	A	A[1]	A[1]	-	A[2]		A	-	B	B	A	-	A	A	B	A	B	B	A	A		A	A	A
Dichloroethane	D	B[2]	A[1]	C[1]	D	-	-	C[1]	A[1]	A[1]	-	A[1]	A[1]	B	B	-	B[1]	A	-	-	-	A	-	-	C	-	D	-	D	-	-	A[2]	D	-	-	A
Diesel Fuel	A[2]	A[1]	A[1]	C[1]	A[2]	-	-	A	D	A	A	A	A	A	A	-	B	-	A	A	A	B	A	-	A	A	B	A	D	B	D	A[1]	-	D	A	A
Diethylamine	D	A	B[2]	D	D	-	-	A	-	B	-	A[1]	A	B[1]	-	A	D	-	A	-	B[1]	-	A	A	D	C	C	C	B	C	B	A	A	B	A	A
Diethylene Glycol	-	C[1]	B[2]	B[2]	A	B	-	A[1]	A[1]	A	-	-	A[2]	A[2]	A	A	A	-	A	A	B[1]	B	A	A	A	A	A	A	D	A	A	-	A	B	A	A
Diphenyl Oxide	-	A	D	-	D	-	-	-	-	D	A	B[2]	A[1]	B[1]	B[1]	A	A[1]		A	A	B[1]	B[1]	A	A	A	A	D	A	D	D	D	-	D	C	A	-
Dyes	-	A	-	-	B[2]	-	-	A	A	C	-	-	-	A	A	A	-	-	C	-	B	-	-	-	A	-	C	-	-	-	-	-	C	-	-	-
Epsom Salts (Magnesium Sulfate)	A[2]	A	A	A[2]	A[2]	-	A	A[1]	A[1]	B	A	A	A	B	B[1]	B	A[1]	A	C	A	B[1]	B	A	A	A	A	A	A	A	B	A	A	B	A	A	A
Ethane	-	A[1]	C[1]	-	D	-	-	D	-	-	-	A	A	A[1]	-	A	-	-	A	-	-	-	A	A	A	A	B	A	D	B	D	-	A	D	A	A
Ethanolamine	-	A[1]	B	-	D	-	A	A	A	D	A	C	A	A	A	A	B	A	A	-	B[1]	B	A	A	D	B	B	B	B	C	C	D	-	B	A	A
Ether	D	A[1]	D	C[1]	D	-	D	A	D	A[1]	A	B[1]	A	B[1]	B[1]	B[1]	A[1]	A	A	C	B[1]	B[1]	A	A	C	D	D	D	D	D	C	B[1]	D	D	A	A
Ethyl Acetate	D	C[1]	B	C[1]	C[1]	C	A	A[2]	D	A	A	A[1]	A	B	B	B[1]	A[1]	A	A	A	B[2]	A	A	A	D	D	D	D	C	D	B	A[1]	B	A	A	A
Ethyl Chloride	D	A[1]	C[1]	C[1]	D	D	D	A[1]	D	A[1]	A	A	A	A	A	A	C	A	A	C	B	B	A	A	A	A	B	A	B	D	A	B[1]	-	D	A	A
Ethyl Sulfate	-	A[1]	-	-	-	-	-	-	-	-	-	-	A	D	-	A	-	D	A	-	-	-	A	A	A	A	-	A	-	-	-	A	B	C	A	A
Ethylene Chloride	D	B[1]	C[1]	C[1]	D	-	-	B[1]	D	A[1]	A	A	A	A	A[1]	D	B[1]	A	-	-	B[1]	-	A	-	B	D	D	D	D	D	D	A[1]	B	B	A	A
Ethylene Dichloride	D	C[1]	C[1]	C[1]	D	D	D	B[1]	D	B[1]	A	A	A	A[1]	A[1]	A	B	A[1]	C	A	B[2]	B	C	-	A	D	D	D	D	D	C	A[1]	D	D	A	A
Ethylene Glycol	A	C[1]	A[2]	A[1]	A[1]	B	A	B[1]	A[1]	B	A	A	A	A[1]	A[1]	B	A[1]	A	A	A	B[1]	B[1]	A	A	A	A	A	A	A	A	A	A	A	B	A	A	A
Ethylene Oxide	C[1]	A[1]	C[2]	C[1]	C[1]	-	D	A[1]	A[1]	-	D	A	A	C[1]	C[1]	-	-	A[1]	A	D	D	-	A	-	D	D	D	D	D	D	C	A	-	D	A	A
Fatty Acids	B[1]	A[1]	B[2]	A	B[1]	-	D	A[1]	A[1]	A[1]	-	A	A	A	B	B	B	A	C	C	A	A	A	-	A	B	B	B	C	D	D	A	B	C	A	A
Ferric Chloride	A	A[1]	B[1]	A[1]	A[2]	-	A	A	A	D	A	A	A	C[1]	D	D	A	D	D	D	D	B[2]	A	-	A	A	B	A	A	B	A	A[1]	B	B	A	A
Ferric Nitrate	A	A[1]	B	B[2]	A[2]	-	-	A[1]	A[1]	D	A	A	A	A[1]	B[1]	B[1]	A	A	D	-	C[1]	B[1]	A	-	A	A	A	A	A	A	A	A	-	C	A	A
Ferric Sulfate	A	A[1]	B	A[2]	A[2]	C	D	A[1]	A[1]	D	A	A	A	A[1]	B	B	A[1]	A	D	D	C[1]	A[1]	C	-	A	A	A	A	A	A	A	A	B	B	A	A
Ferrous Chloride	A	A[1]	A	A[1]	A[2]	-	A	C[1]	A[1]	D	A	A	A	C[1]	D	D	A	C[1]	C	D	D	B[1]	A	-	A	A	A	A	A	A	-	B[1]	B	-	A	A
Ferrous Sulfate	A	A[1]	A	A[1]	A[2]	-	-	C[1]	A[1]	D	A	A	A	B	B[1]	B	A[1]	B	D	D	A[1]	B	A	-	-	A[2]	-	A[2]	-	-	A	A	B	-	A	A
Fluoboric Acid	A[2]	A	A	B[2]	A[2]	-	A	D	B	-	A	A[1]	A	C	B[1]	-	D	B[1]	D	D	D	A[1]	A	-	-	A	A	A	A	A	A[2]	-	B	-	D	A
Fluorine	A[1]	D	D	C[1]	D	-	-	D	-	-	D	A[1]	A	C	C	C	D	C	D	D	D	B[1]	D	-	B	-	-	-	-	-	A[1]	A	-	D	-	C
Fluosilicic Acid	A[2]	C	A	B[1]	A[1]	-	-	D	B[2]	-	A	A[1]	A	B[1]	C	C	D	B[2]	D	D	C	B	A	-	-	A	A	A	A	A	A[2]	C	B	-	D	A
Formaldehyde 40%	A[1]	A[1]	A[1]	A[2]	A[1]	-	-	C[1]	A	A[1]	A	A[2]	A	A[1]	A[1]	A[1]	B	B	A	B	B	B	-	A	A	B	B	B	-	-	A	A	-	-	A	A
Formaldehyde 100%	A	A	C	B	A	B	B	D	-	A	B	A	A	A	C	B	A	-	A	C	A	A	A	A	D	C	C	C	B	C	A	A	B	B	A	-
Formic Acid	A[1]	C[1]	A[1]	B[2]	A[1]	B	C	C	A	D	A	A[2]	A	C	B	B[1]	C[1]	A[1]	C	D	B[1]	A	A	B	C	B	A	B	A	A	A	A[1]	B	B	A	A
Freon 11	A[2]	A	D	C	A[2]	C	-	D	-	D	A	C	C	A	C	A	B	-	A	C	-	A	A	A	A	B	D	B	D	A	D	-	D	D	A	-
Freon 12	A[2]	A	D	C	A[2]	C	-	D	-	B	A	A	A	-	D	A	B	-	A	A	A	A	A	A	B	A	A	A	B	A	B	C	D	D	A	-
Freon 22	B	A	A	-	B	-	-	B	-	A	A	D	A	-	-	A	A	-	A	C	-	A	A	A	D	D	A	D	A	A	A	-	D	D	A	-
Freon 113	B	A	D	-	B	-	-	-	-	A	A	B	A	-	-	A	C	-	A	-	-	A	A	A	B	A	C	A	D	A	D	-	D	D	A	-
Freon TF	B	A	D	-	B	-	-	D	-	A	D	B	D	-	-	A	B	-	A	-	D	A	A	A	B	A	A	A	D	A	D	-	D	D	A	-
Fruit Juice	A	A	A	-	A	B	D	A	A	A	-	A	A	A	-	A	A	-	C	D	A	A	A	A	A	A	A	A	D	-	-	A	B	-	A	-
Fuel Oils	-	A[1]	C	C[1]	A[2]	D	-	A[1]	A[1]	B	A	B	A	A	A	A	A	A	A	A	C[1]	A[1]	A	A	A	B	C	B	D	D	D	A	B	C	A	A
Furan Resin	-	A[1]	D	D	A	-	A	-	-	D	A	D	A	A	A[1]	A	-	-	A	-	A	-	-	A	-	D	D	D	D	D	C	A[1]	A	D	-	-
Furfural	D	A[1]	D	C[1]	D	D	D	B	D	D	A	B[2]	A	B	B	B	A[1]	B	A	A	A[1]	B	A	-	D	D	D	D	D	D	B	B[1]	A	D	A	A
Gallic Acid	C	-	A	B[2]	A[2]	-	-	B[1]	-	-	A	A[1]	A	B	B	B	A	B	A	-	C[1]	B[1]	-	-	A	B	B	B	A	B	B	-	A	-	-	B
Gasoline	C[1]	A	C[1]	C[1]	C[1]	D	A	A	D	B	A	A	A	A	A	A	B	A	A	A	A[2]	A	A	A	A	A	B	A	D	B	D	A	A	D	A	A
Gelatin	A[2]	B	A	A[2]	A[2]	-	D	A[1]	A[2]	A	-	A	A	A[2]	A[2]	A[2]	A	A	A	D	B[2]	A	A	A	A	A	A	A	A	A	A	-	A	A	A	A
Glucose	A[2]	B	A	A[2]	A[2]	B	A	B[1]	A[2]	A	B	A	A	A	A[1]	A	A	-	A	A	A	A	A	A	A	A	A	A	A	A	A	-	A	A	A	A
Glue: P.V.A.	A	A	-	A[1]	C	-	-	A[1]	-	A	-	-	A	A[2]	A[1]	A	A	A	A	A	C	A	A	A	A	A	A	A	A	A	A	-	C	A	A	B

Derlin,Hypolon,Neoprene,Teflon,Biton-Reg TM E.I. du Pont de Nemours & Co
KelF-Reg TM Minnesota Mining & Mfg. Co

Ryton-Reg TM Phillips Petrolum Co
Tygon-Reg TM Norton Co
Noryl-Reg TM General Electric Co

Kynar-Reg TM Penwalt Corp
Cycolac-Reg TM Mar-Bon Corp

MATERIAL COMPATIBILITY

3.43 | Guide Only

Ratings-chemical effect

- **A - No effect - Excellent**
- **B - Minor effect - Good**
- **C - Moderate effect - Fair**
- **D - Sever effect - Not recommended**

Explanation of footnotes

1. **Satisfactory to 72°F**
2. **Satisfactory to 120°F**
3. **Satisfactory for O-rings**

	CPVC	Epoxy	Polypropylene	Polyethylene	PVC	Cyolac ® (ABS)	Phenolic	Nylon	Noryl ®	Delrin ® (Acetal)	Ryton ® to 200°F	Kynar ® (PVDDF)	Teflon ®	Stainless steel (316)	Stainless steel (304)	Stainless steel (440)	Titanium	Carpenter 20	Cast bronze	Cast iron	Aluminum	Hastelloy C	Carbron.ceramic	Caramagnet A	Viton ®	Buna N	Neoprene ®	Nitrile	Natural rubber	Hypalon ®	EPDM	Kel-F®	Tygon	Silicone	Ceramic	Carbon/graphite
Glycerin	A	A	A	A[1]	A[1]	C	A	A[1]	A	A	A	A	A	A	A[2]	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Glycolic Acid	A	A	A	A[2]	A[2]	B	-	-	-	A	A	A[1]	A	A	A	A	B[1]	-	-	-	-	-	A	-	A	A	A	A	A	A	A	A[1]	-	A	A	A
Gold Monocyanide	-	A	-	-	-	-	A	-	-	A	-	A	D	A	A	A	-	-	A	D	-	-	-	A	A	A	A	A	-	-	-	-	A	-	A	-
Grape Juice	A	A	-	B	B	B	A	A	-	A	-	A	D	A	A	A	A	A	C	D	-	-	-	A	A	A	A	A	-	-	-	-	B	-	A	-
Grease	-	A	-	-	A	-	D	-	-	D	-	A	A	A	-	A	-	A	A	A	-	A	-	A	A	D	D	D	-	-	-	-	B	-	A	-
Heptane	A	A	C[2]	B[1]	C[1]	D	D	A	A[1]	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	D	A	D	A	-	D	A	B
Hexane	B[1]	B	B[1]	C[1]	B[1]	-	D	A[1]	-	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	A	D	B	D	A	-	D	A	A
Honey	-	A	A	B	A	-	D	A	-	A	-	A	A	A	-	A	-	A	A	A	A	A	A	A	A	-	-	-	-	-	-	-	A	-	A	-
Hydraulic Oil - Petroleum	-	A	D	C	A	-	D	A[1]	-	B	D	A	A	A	A	A	-	A	A	A	A	A	A	A	A	A	B	A	D	B	D	-	A	C	A	B
Hydraulic Oil - Synthetic	-	A	D	A	A	-	-	A[1]	-	-	-	A	A	A	A	A	-	A	A	-	A	A	A	A	A	-	-	-	-	-	-	-	A	-	A	B
Hydrazine	D	A	C	-	-	-	A	-	-	B	-	A	C	A	A	-	-	-	D	C	-	-	-	-	A	B	B	B	-	B	A	-	-	C	A	-
Hydrobromic Acid 20%	A	B[1]	A[2]	B[2]	B[2]	-	D	D	B	C	-	A	-	D	D	D	A	-	D	D	D	A[1]	A	A	A	D	B	D	A	A	A	A	B	D	-	A
Hydrobromic Acid 100%	A[2]	D	C[1]	B[1]	A[1]	B	D	D	B	D	A[1]	A	A	D	D	D	A	-	D	D	D	C	A	B	A	D	D	D	A	A	A	A	B	D	A	A
Hydrochloric Acid - Dry Gas	A	A	B	A[2]	A[2]	-	-	A[1]	A	-	A	A	A	D	D	D	C	A	D	A	D	A	A	-	-	-	-	-	-	-	-	A	-	-	A	A
Hydrochloric Acid 20%	A[2]	A[1]	B[2]	A[2]	A[2]	A	A	D	A	C	A	A	A	D	D	D	C	D	D	D	D	A[1]	A	A	A	-	-	-	-	-	-	-	A	B	-	A	A
Hydrochloric Acid 37%	A[2]	A	C	B[2]	B	A	C	D	A	C	A	A	A	D	D	D	C	D	D	D	D	-	A	C	A	B	B	B	B[1]	A	A	A	C	B	A	A
Hydrochloric Acid 100%	A	-	B[1]	-	B[2]	A	-	D	A	C	A[1]	A	A	D	D	D	D	D	D	D	D	B[2]	A	C	A	D	D	D	D	D	C	A	-	D	A	A
Hydrocyanic Acid	A	A	A	A[2]	A[1]	B	D	C[1]	A[1]	B	B	A	A	B[1]	B[1]	B[1]	B	A	D	D	B[1]	A[1]	A	A	A	B	A	B	-	-	A	-	B	-	A	A
Hydrocyanic Acid (Gas 10%)	A	-	A	-	A	-	-	-	C	C	-	-	A	-	-	A	A	-	D	-	-	-	-	-	A	B	A	B	-	-	A	-	-	-	A	-
Hydrofluoric Acid 20%	C[1]	A	A[2]	A[2]	B	C	D	C[1]	C[1]	D	A	A	A	D	D	D	D	B[2]	D	D	D	A	B	C	A[1]	B[1]	B[1]	B[1]	B[1]	A[1]	A[1]	A[1]	D	D	C	A
Hydrofluoric Acid 50%	C[1]	C[2]	A[2]	A[1]	B[1]	C	D	D	D	D	A	A	A	D	D	D	D	B[2]	D	D	D	B[2]	D	D	A[1]	B[1]	B[1]	B[1]	B[1]	A[1]	A[1]	A[1]	D	D	D	A
Hydrofluoric Acid 75%	C[1]	B[1]	C[1]	C[1]	C	C	D	D	D	D	B	A	A	D	D	D	D	B[1]	D	D	D	B[2]	D	D	A[1]	D	D	D	D	A	C	A[1]	D	D	D	A[2]
Hydrofluoric Acid 100%	C[1]	-	C[1]	-	C	D	D	D	D	D	D	A	A	B[1]	B[1]	D	D	B[1]	D	D	D	B	D	D	A[1]	D	D	D	D	A	C	-	D	D	D	-
Hydrofluosilicic Acid 20%	A	C[1]	A	B[1]	A[2]	-	D	D	B[2]	B	A	A	A	B[1]	C[2]	D	D	B[2]	D	D	D	B	A	D	A	A	C	A	-	-	A	A	A	-	A	A
Hydrofluosilicic Acid 100%	-	C[1]	A	B[1]	B[1]	-	-	D	B[2]	A	A[1]	A[1]	A	C[2]	D	D	D	B[2]	D	D	D	B	A	-	A	B	B	B	A	A	A	A	D	D	A	A
Hydrogen Gas	A[2]	-	A	A[2]	A[2]	-	-	A[2]	A[1]	-	A	A	A	A	A	A	A	A	A	-	A	A	-	-	A	A	A	A	B	A	A	A	A	C	-	A
Hydrogen Peroxide 10%	A	C[1]	B[1]	A[2]	A[1]	A	D	C[1]	A[2]	D	A	A	A	B	B[2]	B	B[1]	B[1]	C	C	A	A	A	A	A	-	-	-	-	-	-	A	D	B	A	C
Hydrogen Peroxide 30%	A	B	B[1]	C[2]	A[1]	-	D	D	A[2]	D	A[1]	A	A	B	B[2]	B	B[1]	B[1]	B	B	A	A	-	-	A	-	-	-	-	-	-	A	-	B	-	C
Hydrogen Peroxide 50%	A	-	B[1]	C[2]	A[1]	-	D	D	-	D	-	A[1]	A	A[2]	B[2]	B[1]	B[1]	B[1]	B	-	A	A	-	-	A	-	-	-	-	-	-	A	-	B	-	C
Hydrogen Peroxide 100%	A	A	B[1]	C[2]	C[2]	B	D	D	A	D	C	A[1]	A	A[2]	B[2]	B[1]	B[1]	B[1]	D	B	A	D	-	A	A	B	A	B	B	B	A	A	D	B	-	C
Hydrogen Sulfide (aqua)	A	A	A[1]	A	B[1]	B	D	C[1]	A[1]	C	A	A	A	C[1]	C	C	A	A	D	D	B	A[1]	A	A	D	D	A	D	D	B	A	A[1]	D	C	A	A
Hydrogen Sulfide (dry)	A	A	A[1]	A	A[2]	-	D	C[1]	-	-	A	A	A	B	C[1]	C[1]	A	B	D	D	B	A[1]	-	A	D	A	A	A	A	A	A	A[1]	D	C	-	A
Hydroxyacetic Acid 70%	A	A	-	-	D	-	-	-	-	A	-	A	-	-	-	-	A	-	D	B	-	-	A	A	A	A	A	A	-	-	A	-	-	-	A	-
Ink	-	A	-	-	C	B	-	C	-	A	-	A	D	C	C	-	-	-	D	D	-	-	A	A	A	A	A	A	D	-	-	-	C	-	A	-
Iodine	D	C	C	A[1]	D	D	-	D	C[1]	D	D	A[2]	A	C	C	C	C	A	D	D	A	B	D	A	A	B	D	B	-	B	B	A	D	-	D	A
Iodine (in alcohol)	-	-	-	B	-	-	-	C	-	D	-	A	-	-	-	-	D	B	-	-	B	D	-	A	-	-	-	-	-	-	-	-	-	-	-	-
Iodoform	-	-	-	-	A	-	-	-	-	-	-	C	C	B	-	-	-	-	A	-	-	A	-	-	-	-	A	-	B	-	A	-	C	-	-	-
Isobutane	-	A	D	-	A	-	-	D	-	-	-	A	-	-	-	A	-	-	-	-	D	-	-	A	A	A	D	A	-	-	-	-	-	-	-	-
Isopropyl Acetate	-	A	B[1]	B[1]	D	-	-	B[1]	-	D	-	D	A	A	C	A	-	A[1]	B	-	B	B	-	A	D	D	D	C	D	D	B	-	-	D	A	A
Isopropyl Ether	-	D	B	A	B	-	-	A[1]	-	D	-	D	A[1]	A	A	-	-	A	A	-	A	A	A	A	D	B	C	B	D	C	D	A	A	D	A	A
Jet Fuel (JP3: JP4: JP5)	-	A	A[1]	B	A[1]	-	D	A[1]	D	A[1]	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	D	A	D	D	D	A	A	D	A	A
Kerosene	-	A	A[1]	C[1]	A[2]	D	A	A	D	A[2]	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	C	A	D	D	D	A	D	D	A	A
Ketones	-	C	C	C[1]	B	D	-	A[2]	D	D	A	C[1]	A	A	A	C	A	A	A	-	A	A	C	A	D	D	D	D	A	-	D	B[1]	D	-	C	A
Lacquers	-	A	C	B[1]	C	-	A	A[1]	D	D	-	D	A	A	A[1]	A	-	A	A	C	A	A	A	A	D	D	D	D	D	D	D	-	A	D	A	A
Lacquer Thinners	-	A	C	B[1]	C	-	A	A[1]	D	D	-	-	A	A	A[1]	A	C	A	A	C	A	A	-	A	D	D	D	D	D	D	D	-	-	D	-	A
Lactic Acid	A[1]	B[1]	A[1]	A[1]	B[1]	B	D	C[1]	A	B	A	B[1]	A	B[1]	B[1]	B[1]	B	B[2]	C	D	B	B[1]	A	A	A	A	A	A	A	A	A	A[1]	B	A	A	A
Lard	-	B	B[1]	B[1]	A[1]	-	D	A[1]	A	B	-	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	C	A	D	D	D	-	A	B	A	A
Latex	-	A	A[2]	-	-	B	D	A[1]	-	C	-	A	A	A[2]	A[2]	-	-	-	A	-	A	A	-	A	A	A	-	A	-	-	A	-	A	-	-	-
Lead Acetate	A[2]	A	A[1]	A[2]	A[2]	B	-	B[1]	A[1]	D	A	A	A	B[1]	B	B[1]	A[1]	B[1]	A	A	D	B[1]	A	A	D	B	B	B	A	D	A	A	B	D	A	A
Lead Sulfamate	-	A	A[2]	A[1]	A[2]	-	-	B[1]	-	A	-	A	A[1]	C	C	A	-	-	-	-	C	-	-	-	A	B	A	B	B	A	A	-	-	B	-	-
Ligroin	-	A	A[2]	C[2]	-	-	-	D	-	B	-	A	-	A	-	A	-	-	A	-	D	-	-	A	A	A	B	A	D	C	D	-	A	D	-	-
Lime	-	A	-	B[1]	A[1]	-	D	A[1]	-	B	-	A	A[1]	A	A	A	A	-	A	A	D	-	A	A	A	A	A	A	-	-	D	-	A	-	A	A
Lubricants	-	A	A[1]	D	B[2]	-	A	A[1]	C[1]	A	A	A	A	A[2]	A[2]	A[2]	A	A[2]	A	A	A[2]	A	A	A	A	A	B	A	D	D	D	-	B	D	A	A
Magnesium Carbonate	A[2]	A	A	A[2]	A[2]	B	-	-	A[2]	A	-	A	A[1]	A[1]	A[1]	A[1]	A	A	A	-	B	-	-	A	A	A[2]	-	A[2]	-	-	A	-	-	-	-	-
Magnesium Chloride	A	A	A	A[2]	A[2]	B	A	A[1]	A	A	A	A	A	A[1]	B[1]	B	A	B	C	D	D	A[2]	-	A	A	A	A	A	A	A	A	A	B	A	-	A
Magnesium Hydroxide	A	A	A	A[2]	A[2]	B	D	B[1]	A[2]	A	A	A	A	A[1]	B	B	A	B	A	A	C[1]	B[1]	A	A	A	B	B	B	B	A	A	A	C	A	A	A
Magnesium Nitrate	A	A	A	A[2]	A[2]	B	A	A[1]	A[1]	A	A	A	A	A[1]	A	A	A	A	D	D	C	A	-	A	A	A	A	A	-	-	A	-	-	-	-	-
Magnesium Oxide	-	A	-	-	-	-	D	-	-	A	-	-	-	A	-	A	-	-	A	A	-	-	-	A	C	A	A	A	-	-	-	-	-	-	-	-
Magnesium Sulfate	A	A	A	A[2]	A[2]	B	A	A[1]	A[1]	A	A	A	A	B	B	B	A	A	C	A	B[1]	A[2]	A	A	A	A	A	A	B	A	A	A	B	A	A	A	A
Maleic Acid	A	A	A	B[2]	A[2]	-	-	B[1]	A[1]	A	B	A	A	B	A	A	A	B	A	A	B[1]	B	A	A	A	D	D	D	D	D	D	-	C	-	A	A

Derlin,Hypolon,Neoprene,Teflon,Biton-Reg TM E.I. du Pont de Nemours & Co
KelF-Reg TM Minnesota Mining & Mfg. Co

Ryton-Reg TM Phillips Petrolum Co
Tygon-Reg TM Norton Co
Noryl-Reg TM General Electric Co

Kynar-Reg TM Penwalt Corp
Cycolac-Reg TM Mar-Bon Corp

Ratings-chemical effect

A - No effect - Excellent
B - Minor effect - Good
C - Moderate effect - Fair
D - Sever effect - Not recommended

Explanation of footnotes

1. **Satisfactory to 72°F**
2. **Satisfactory to 120°F**
3. **Satisfactory for O-rings**

	CPVC	Epoxy	Polypropylene	Polyethylene	PVC	Cyolac ® (ABS)	Phenolic	Nylon	Noryl ®	Delrin ® (Acetal)	Ryton ® to 200°F	Kynar ® (PVDDF)	Teflon ®	Stainless steel (316)	Stainless steel (304)	Stainless steel (440)	Titanium	Carpenter 20	Cast bronze	Cast iron	Aluminum	Hastelloy C	Carbron.ceramic	Caramagnet A	Viton ®	Buna N	Neoprene ®	Nitrile	Natural rubber	Hypalon ®	EPDM	Kel-F®	Tygon	Silicone	Ceramic	Carbon/graphite
Maleic Anhydride	-	A	D	-	-	-	-	-	-	D	-	A	-	-	-	A	-	-	-	-	A	-	A	A	A	D	D	D	D	D	D	-	-	-	A	-
Malic Acid	-	-	A[1]	B[2]	A[2]	-	-	C[1]	-	A	-	A	A	A[2]	A	B[1]	A	B[2]	A	-	B[1]	B	-	A	A	A	B	A	A	B	D	-	D	B	-	A
Mash	-	A	-	-	-	-	-	A	-	A	-	-	-	A	-	A	-	-	A	-	A	-	A	A	A	A	A	A	-	-	A	-	A	-	A	-
Mayonnaise	-	A	-	B	D	-	-	A	-	-	-	A	D	A	C	A	-	-	D	D	A	A	A	A	A	C	A	C	D	-	-	-	D	-	A	-
Melamine	A[2]	A	A	-	A[2]	-	D	A	-	-	-	-	A	D	-	-	-	-	D	D	-	-	A	A	A	C	D	C	-	-	A	-	D	-	A	D
Mercuric Chloride (dilute)	A	A	A	A[2]	A[2]	-	A	D	A[2]	B	A	A	A	C	D	D	A[1]	D	D	D	D	C	A	A	A	A	A	A	A	A	A	A	D	-	A	C
Mercuric Cyanide	A	A	A	A[2]	B[2]	-	-	A	A[2]	-	-	A	A	B	B	D	A	A	D	-	D	-	A	A	A	A	A	A	D	-	-	A	D	-	A	A
Mercury	A	A	B	A[2]	B	B	D	A[2]	A[1]	A	-	A	A	A	A	A	A	A	D	A	-	A[2]	A	A	A	A	A	A	A	A	A	A	D	-	A	C
Methanol (Methyl Alcohol)	A	B[1]	A	A[1]	A[1]	B	A	C[1]	A[1]	A	A	A	A	A	A	B[2]	B	A	A	A	A[1]	A	A	A	A	A	A	A	A	A	A	A[2]	A	A	A	A
Methyl Acetate	-	D	D	B[1]	D	-	-	A[2]	-	B	-	D	A	A	A	-	-	A	A	-	A	A	A	A	D	D	B	D	D	D	B	A	A	D	A	A
Methyl Acetone	-	A	D	-	-	-	-	-	-	B	-	D	-	-	-	-	-	-	-	-	-	-	A	A	D	D	B	D	D	D	B	-	-	D	A	-
Methyl Acrylate	-	C	-	-	-	-	-	A	-	D	-	D	A	A	A	-	-	A	B	-	A	-	-	A	A	D	D	D	A	-	-	-	A	-	-	A
Methyl Alcohol 10%	A[1]	B[1]	A[2]	A[1]	A[1]	-	A	C[1]	A[1]	A	A	A	A	A	A	B[1]	B	A	A	A	A[1]	A	-	-	D	A	A	A	A	A	A	A[2]	A	-	-	A
Methyl Bromide	D	B[1]	C	-	D	D	-	C	-	D	-	A	A	A	A	B	-	-	-	-	-	-	A	A	A	B	D	B	D	D	D	-	-	A	A	A
Methyl Butyl Ketone	-	C	D	-	A	-	-	D	-	D	-	D	-	A	-	B	-	-	A	-	-	-	A	A	D	D	D	D	D	D	A	-	D	A	A	-
Methyl Cellosolve	-	C	B[1]	-	B[2]	-	-	C	-	D	-	A	A	A	A	C	-	A	-	-	A	-	A	A	D	C	B	C	D	D	B	-	D	A	A	A
Methyl Chloride	-	A	D1	C[1]	D	-	-	C	D	D	A[1]	A	A	A	A	C	A	B[2]	C	A	D	B	A	A	A	D	D	D	D	D	C	A[1]	D	A	A	A
Methyl Dichloride	-	A	D	-	A	-	-	C	-	D	-	A	-	-	-	A	-	-	-	-	-	-	A	A	A	D	-	D	-	-	D	-	-	-	A	-
Methyl Ethyl Ketone	D	C[1]	A[1]	B[2]	D	D	A	A[1]	D	B	A	C[2]	A	A	A	B	A	A	A	A	A[2]	A	A	A	D	D	D	D	D	D	A	A[1]	D	D	A	A
Methyl Isobutyl Ketone	-	C	C[1]	B[1]	D	-	A	A[1]	D	D	A	A[1]	A	A[2]	A	B	A	A	C[1]	A	A[2]	A	A	A	D	D	D	D	D	D	C	A	-	D	A	A
Methyl Isopropyl Ketone	-	C	D	-	-	-	A	-	-	D	-	D	-	A	-	B	-	A	A	-	-	A	A	A	D	D	D	D	D	D	B	-	-	D	A	-
Methyl Methacrylate	-	A	D	-	-	-	-	-	-	D	-	D	-	-	-	A	-	-	-	-	-	-	A	A	D	D	D	D	D	D	D	-	-	C	A	-
Methylamine	-	A	-	-	A	-	-	-	-	-	-	-	A	A	-	A	-	-	D	-	-	-	A	A	D	C[1]	-	C[1]	B	-	A[1]	-	D	-	A	-
Methylene Chloride	D	A	B[1]	C[1]	D	D	A	C[1]	D	A[1]	A[1]	B[2]	A	B	B	B	B	B	A	A	A[1]	B	A	A	B	D	-	D	B	-	D	A	D	-	A	A
Milk	A	A	B	A[2]	A[2]	B	A	A[2]	A[2]	A	-	A	A	A[2]	A[2]	B	A	A	C	D	A	A	A	A	A	A	A	A	A	A	A	A	B	A	A	A
Molasses	A	A	A	A	A[2]	B	A	A[1]	A[2]	A	-	B[2]	A	A	A	B	A	A	D	A	A	A	A	A	A	A	A	A	A	-	-	A	B	-	A	A
Mustard	A	A	A	A	B	-	D	A[1]	A	C	-	A	A	A	A	C	A	A	D	D	B	A	A	A	D	C	A	C	B	-	-	-	B	-	A	A
Naphtha	A	A	C	A	C	D	A	A[1]	D	D	A	A	A	A	A	A	B	A	B	A	A	B	A	A	A	C	D	C	D	D	D	A	C	D	A	A
Naphthalene	D	A	B[2]	A	D	D	A	A[1]	D	D	A	A	A	A	A	A	A	A	C	A	B[1]	A	A	A	A	D	D	D	D	D	D	A	C	D	A	A
Nickel Chloride	A	A	A	B[2]	A[2]	B	A	C[1]	A[1]	A	A	A	A	C	D	D	A	B[1]	D	D	D	B	A	A	A	A	B	A	A	A	A	A	B	A	A	A
Nickel Sulfate	A	A	A	B[2]	A[2]	B	C	A[1]	A[1]	A	A	A	A	B[1]	B	B	B	B	C	D	D	B	A	A	A	A	A	A	B	A	A	A	A	A	A	A
Nitrating Acid (<15% H2SO4)	-	-	C	-	D	-	-	-	-	-	C	-	A	C	C	-	A	-	D	A	D	A	D	A	-	-	A	-	C	-	-	-	D	-	A	-
Nitrating Acid (>15% H2SO4)	-	D	C	-	D	-	-	-	-	-	D	-	A	C	C	D	C	-	D	C	D	A	D	A	-	-	A	-	C	-	-	-	D	-	A	-
Nitrating Acid (<1% Acid)	-	-	C	-	D	-	-	-	-	-	C	-	A	A	C	-	-	-	D	-	D	A	D	A	-	-	A	-	C	-	-	-	D	-	A	-
Nitrating Acid (>Š15% HNO3)	-	-	C	-	D	-	-	-	-	-	C	-	A	D	C	-	C	-	D	C	D	A	D	A	-	-	A	-	C	-	-	-	D	-	A	-
Nitric Acid (5-10%)	A	A[1]	A[2]	B[2]	A[1]	B	D	C[1]	A	D	A[1]	A	A	A	A	B	A[1]	A[1]	D	D	D	A[1]	D	B	A	D	B	D	D	B	B	A[1]	D	C	C	A
Nitric Acid (20%)	A[2]	B[1]	A[2]	C[1]	A[1]	B	D	D	B[2]	D	A[1]	A	A	A	A	B	A[1]	A[1]	D	D	D	A[1]	D	C	A	D	D	D	D	D	B	A[1]	D	D	D	A
Nitric Acid (50%)	A[1]	D	D	C[1]	B[1]	C	D	D	B[2]	D	B	A	A	A[1]	A	B	A[1]	A[1]	D	D	C	A[1]	D	A	A	D	D	D	D	D	D	A	D	D	D	D
Nitric Acid (Concentrated)	D	D	D	C[1]	D	D	D	D	B[1]	D	B[1]	A	A	A[1]	A	C	A[1]	A[2]	D	D	A[2]	B[1]	D	A	A	D	D	D	D	D	D	A[1]	D	D	D	D
Nitrous Acid	A	-	A	-	A	-	-	-	-	D	-	-	A	A	A	-	-	-	A	-	-	-	-	A	A	-	D	-	C	-	A	-	A	-	A	-
Nitrobenzene	D	C[1]	B[1]	C[1]	D	D	D	B[1]	D	B	A	A[1]	A	A	B	B	A	A	C	C	A[1]	D	A	-	B	D	D	D	D	D	D	A[1]	D	D	A	B
Oils: Anline	-	A	A	-	D	D	D	A	D	D	-	A	A	A	A	A	D	A	A	A	D	B	A	A	C	D	D	D	D	D	B	-	D	D	A	-
Oils: Arinse	-	A	-	-	-	-	A	-	-	D	-	-	-	A	-	A	-	A	A	A	-	-	A	A	-	D	-	-	-	-	-	-	-	-	A	-
Oils: Bay	-	A	-	-	-	-	A	-	-	D	-	A	-	A	-	A	-	A	A	A	-	-	A	A	A	-	D	-	-	-	-	-	-	-	A	-
Oils: Bone	-	A	A	-	-	-	-	-	-	D	-	A	-	A	-	A	-	A	A	A	-	-	A	A	A	A	D	A	-	-	-	-	A	-	A	-
Oils: Castor	A	A	A	-	A	-	A	A	-	A	-	A	A	A	A	A	A	-	A	A	-	-	A	A	A	A	A	A	A	A	B	-	A	A	A	-
Oils: Cinnamon	-	A	-	-	-	-	A	-	-	D	-	-	-	A	A	A	-	-	A	-	-	-	A	A	A	-	C	-	-	-	-	-	-	-	A	-
Oils: Citric	-	A	-	-	-	-	A	-	-	D	-	A	D	A	-	A	-	-	D	D	A	A	A	A	A	-	D	-	-	-	-	-	D	-	A	-
Oils: Clove	-	A	-	-	-	-	A	-	-	-	-	-	-	A	A	A	-	-	A	-	B	A	A	A	A	A	C	A	-	-	-	-	-	-	A	-
Oils: Cocoa Nut	A[1]	A	A[1]	-	A[1]	-	A	-	-	A	-	A	A	A	A	A	-	-	A	A	A	A	A	A	A	A	C	A	D	C	C	-	A	A	A	-
Oils: Cod Liver	A[1]	A	A[1]	-	A[1]	-	A	-	-	B	-	A	A	A	A	A	-	-	A	-	A	A	A	A	A	A	B	A	D	B	A	-	-	B	A	-
Oils: Corn	-	A	A[1]	C	B	-	-	-	A	D	-	A	A	A	-	A	-	-	C	A	A	A	A	A	A	A	C	A	D	B	C	-	B	A	A	-
Oils: Cotton Seed	A	A[1]	A	B[2]	B[2]	-	A	A	A	B[1]	A	A	A	A	A	A	A	-	A	A	A	A	A	A	A	A	C	A	D	B	C	A[2]	B	A	A	A
Oils: Caresote	-	A[1]	C[1]	C[2]	C	-	-	D	D	D	-	A	A	B[2]	A[2]	B	A	A[2]	A	A	B	B	A	A	A	B	C	B	D	C	D	A	-	D	A	A
Oils: Diesel Fuel (20: 30: 40: 50)	-	A[1]	A[1]	C[1]	A[2]	-	A	A	D	D	A	A	A	A	A	A	B	A	A	A	A	B	A	A	A	A	B	A	D	B	D	A[1]	A	D	A	A
Oils: Fuel (1: 2: 3: 5A: 5B: 6)	-	A[1]	C[1]	C[1]	A[2]	-	A	A[1]	A[1]	D	A	B	A	A	A	A	A	A	A	A	C[1]	A[1]	A	A	A	B	D	B	D	D	D	A	A	C	A	A
Oils: Ginger	-	A	-	-	-	-	A	-	-	A	-	A	-	A	A	A	-	D	D	-	-	-	A	A	A	A	A	A	-	-	A	-	-	-	A	-
Oils: Hydraulic (see Hydraulic)																																				
Oils: Lemon	-	A	-	-	-	-	A	-	-	D	-	A	A	A	A	A	-	A	A	-	D	-	A	A	A	-	D	-	-	-	D	-	-	-	A	-
Oils: Linseed	A	A	A	C[1]	A[2]	-	A	A[1]	A[1]	A	B	A	A	A[1]	A[1]	A	A	A	A	-	B	A	A	A	A	-	C	A	D	C	C	-	A	A	A	A

Derlin,Hypolon,Neoprene,Teflon,Biton-
Reg TM E.I. du Pont de Nemours & Co
KelF-Reg TM Minnesota Mining & Mfg. Co

Ryton-Reg TM Phillips Petrolum Co
Tygon-Reg TM Norton Co
Noryl-Reg TM General Electric Co

Kynar-Reg TM Penwalt Corp
Cycolac-Reg TM Mar-Bon Corp

MATERIAL COMPATIBILITY

3.45 | Guide Only

Ratings-chemical effect

A - No effect - Excellent
B - Minor effect - Good
C - Moderate effect - Fair
D - Sever effect - Not recommended

Explanation of footnotes

1. **Satisfactory to 72°F**
2. **Satisfactory to 120°F**
3. **Satisfactory for O-rings**

	CPVC	Epoxy	Polypropylene	Polyethylene	PVC	Cyolac ® (ABS)	Phenolic	Nylon	Noryl ®	Delrin ® (Acetal)	Ryton ® to 200°F	Kynar ® (PVDDF)	Teflon ®	Stainless steel (316)	Stainless steel (304)	Stainless steel (440)	Titanium	Carpenter 20	Cast bronze	Cast iron	Aluminum	Hastelloy C	Carbron.ceramic	Caramagnet A	Viton ®	Buna N	Neoprene ®	Nitrile	Natural rubber	Hypalon ®	EPDM	Kel-F®	Tygon	Silicone	Ceramic	Carbon/graphite
Oils: Mineral	A	A	B[1]	B[1]	A[1]	-	A	A	A[1]	A	A	A	A	A	A	A	A	A	A	-	A	A	A	A	A	-	B	A	D	B	D	A	A	C	A	A
Oils: Olive	A	A	A	A[1]	C	-	A	A[1]	A[2]	-	-	-	A[1]	A	A	-	A	A	A	-	A	A	A	A	A	-	B	A	D	B	B	-	B	D	A	A
Olis: Orange	-	A	-	-	-	-	A	-	-	D	-	A	-	A	A	A	A	A	A	-	A	A	A	A	A	A	C	A	-	-	-	-	-	D	A	-
Oils: Palm	A	A	-	-	A	-	A	-	-	D	-	A	-	A	A	A	A	A	A	A	-	-	A	A	A	A	D	A	-	-	-	-	-	-	A	-
Oils: Peanut	A[1]	A	D	-	A[1]	-	A	-	-	D	-	A	A	A	A	A	A	A	A	A	D	-	A	A	A	A	B	A	D	B	C	-	A	A	A	-
Oils: Peppermint	-	A	-	-	-	-	A	-	-	D	-	A	-	A	A	A	-	A	A	-	D	-	A	A	A	D	D	B	-	-	-	-	-	-	A	-
Oils: Pine	A	A	D	-	C	-	C	A	-	D	-	A	A	A	A	A	A	A	D	C	-	-	A	A	A	B	D	D	D	D	D	-	C	D	A	-
Oils: Rapeseed	A	A	D	-	-	-	A	-	-	D	-	A	-	A	A	A	A	A	A	A	-	-	A	A	A	B	B	B	D	D	A	-	-	D	A	-
Oils: Rosin	-	A	A[2]	B[2]	C[1]	-	A	A[1]	-	-	-	A	A	A[1]	A[1]	B[2]	-	B[1]	A	-	B[1]	A	A	A	A	A	-	A	-	-	-	-	-	-	A	A
Oils: Seasame Seed	A	A	-	-	A	-	A	-	-	D	-	A	A	A	A	A	A	A	A	A	-	-	A	A	A	A	D	A	-	-	-	-	A	-	A	-
Oils: Silicone	A	A	A	A	A	-	A	A[1]	A[1]	A	A[1]	A	A	A	B	A	-	A	A	A	A	A	A	A	A	A	A	A	A	A	A	-	A	C	A	A
Oils: Soybean	A[2]	A	A[1]	A[1]	A[1]	-	D	B[1]	-	D	-	A	A	A	A	A	A	A	A	A	B	A	A	A	A	D	C	D	D	C	C	-	B	A	A	A
Oils: Sperm	A	A	-	-	-	-	A	-	-	D	-	A	-	A	A	A	A	A	A	A	-	-	A	A	A	A	D	A	-	-	-	-	A	-	A	-
Oils: Tanning	-	A	-	-	-	-	A	-	-	D	-	A	-	A	A	A	-	A	A	-	-	-	A	A	A	A	D	A	-	-	-	-	-	-	A	-
Oils: Turbine	A	A	B[1]	A[1]	A[1]	-	A	-	-	D	-	A	A	A	A	A	A	A	A	A	-	-	A	A	A	B	D	B	D	D	D	-	A	D	A	-
Oleic Acid	C[1]	A	B[1]	B[1]	C[2]	D	C	B[2]	A[1]	C[1]	A	A	A	B	B[1]	B[1]	B	B[1]	C	-	B	A[2]	A	A	B	C	C	C	C	C	B	A	B	D	A	A
Oleum 25%	D	D	D	D	D	-	-	D	-	D	A[1]	C[1]	A	B	B[2]	A[2]	D	B	D	-	B	B	-	A	A	D	D	D	D	D	D	A	-	D	-	D
Oleum 100%	D	D	D	D	D	-	C	D	A[1]	D	A[1]	C[1]	A	B	B[2]	A[2]	D	B	D	-	B	B	-	A	A	D	D	D	D	D	D	A	C	D	-	D
Oxalic Acid (cold)	A[1]	A	A[2]	A[2]	A[1]	A	C	B[2]	A[1]	C[1]	A	A[2]	A[1]	B[1]	B	B	D	B[2]	A	C	B[1]	B	A	A	A	B	B	B	B	B	A	A	B	B	A	A
Paraffin	A[1]	A	A[1]	A[1]	A	-	-	A[1]	A	A	-	A	A	A	A	A	A	A	A	-	A	A	A	A	B	A	A	A	B	-	D	-	A	-	A	A
Pentane	-	A	D	D	A	-	-	A[1]	-	B	-	A	A	C	C	A	-	C	C	-	A	B	A	A	A	A	B	A	D	B	D	-	A	D	A	A
Perchloroethylene	C[1]	D	D	D	C[1]	-	-	C[1]	D	A	A	A	A	A[1]	B[2]	A	A	B	D	A	B	B	A	A	A	C	D	C	D	D	D	A	C	D	A	A
Petrolatum	-	A	D	B	B	-	-	D	-	B	-	A	C	A	-	A	-	A	A	-	-	A	A	A	A	A	A	A	C	-	A	-	B	-	A	-
Phenol (10%)	A[1]	C	B	A[2]	C[1]	-	D	D	D	D	A	A	A	B	B	B	A	B	C	D	B	A	-	-	A	D	D	D	D	D	B	B	C	D	-	A
Phenol (Carbolic Acid)	A[1]	C	B	B[1]	C[1]	D	D	C	D	D	A	A	A	B	B	B	A	B	C	D	B	A	A	D	A	D	D	D	D	D	B	B	B	D	A	A
Phosphoric Acid (<40%)	A	A	A[1]	A[1]	B[2]	B	D	D	A	C[1]	A	A	A	B	A	A[2]	B	B	D	D	C	A[2]	B	C	A	D	B	D	D	B	B	A	D	D	B	A
Phosphoric Acid (>40%)	A	B[1]	B[2]	B[1]	B[2]	C	D	B[1]	A	D	A	A[1]	A	B	A[2]	B[2]	C	B	D	D	B	A[2]	B	D	A	D	D	D	D	C	B	A	D	C	B	A
Phosphoric Acid (crude)	-	B[1]	B[2]	B[1]	B[2]	C	D	B[1]	A	D	A	A	A	B	D	D	C	B	D	D	B	A[2]	C	D	A	D	D	D	D	C	B	A	D	C	C	A
Phosphoric Acid Anhydride	-	-	A	-	-	-	D	-	-	D	D	D	-	-	-	-	D	-	A	-	-	-	A	-	-	-	A	-	-	-	-	-	-	-	A	-
Phosphoric Acid (molten)	-	-	D	-	D	D	D	-	-	D	-	D	-	-	-	A	D	-	A	-	-	A	-	-	-	-	A	-	-	-	-	-	D	-	-	-
Photographic Developer	A	A	A	A	A	B	A	-	A	A	-	-	A	A	C	C	A	A	D	D	-	-	A	A	A	A	A	A	A	A	B	-	-	A	A	A
Phthalic Anhydride	D	-	D	-	D	-	-	-	-	-	-	A	A	A	A	A	-	A	B	-	A	A	-	-	A	B	A	B	C	-	A	-	B	-	-	A
Picric Acid	D	A	B[1]	-	D	A	D	C[1]	-	A	A	A[1]	A	B	B	B	A	B	D	A	A[1]	B	-	-	A	B	B	B	B	B	B	A	D	D	-	A
Plating Solutions																																				
Antimony Plating 130°F	A	B	A	-	A	-	A	D	A	A	-	A	A	A	A	B	A	A	A	A	A	A	-	A	A	A	A	A	-	-	-	-	-	A	-	
Arsenic Plating 110°F	A	B	A	-	A	-	A	A	-	A	-	A	A	A	A	B	A	A	A	A	A	A	-	C	A	A	A	A	-	-	-	-	-	-	C	-
Brass Plating																																				
Regular Brass Bath 100°F	A	B	A	B	A	-	A	A	A	A	-	B	A	A	A	A	B	A	A	A	A	A	-	C	A	A	A	A	-	-	-	-	-	-	C	A
High Speed Brass Bath 110°F	A	B	A	B	A	-	A	A	A	A	-	B	A	A	-	B	A	-	A	A	A	A	-	D	A	A	A	A	-	-	-	-	-	-	D	A
Bronze Plating																																				
Cu-Cd Bronze Bath R.T.	A	B	A	-	A	-	A	A	A	A	-	A	A	A	A	B	A	-	A	A	A	A	-	C	A	A	A	A	-	-	A	-	-	-	C	-
Cu-Sn Bronze Bath 160°F	D	C	A	-	D	-	A	A	A	B	-	A	A	A	A	C	D	-	A	A	A	A	-	D	A	A	A	A	-	-	A	-	-	-	D	-
Cu-Zn Bronze Bath 100°F	A	B	A	-	A	-	A	A	A	A	-	A	A	A	A	B	A	-	A	A	A	A	-	C	A	A	A	A	-	-	-	-	-	-	C	-
Cadmium Plating																																				
Cyanide Bath 90°F	A	B	A	-	A	-	-	A	A	A	-	A	A	A	-	B	A	-	A	A	A	A	-	C	A	A	A	A	-	-	-	-	-	-	C	-
Fluroborate Bath 100°F	A	B	A	-	A	-	A	D	A	C[1]	-	A	A	A	A	B	D	-	A	D	A	D	-	D	A	B	C	B	-	-	-	-	-	-	D	-
Chromium Plating																																				
Chromic-Sulfuric Bath 130°F	A	C	A	-	A	-	-	D	D	D	-	C	A	C	-	D	A	-	C	A	A	D	-	A	C	D	D	D	-	-	-	-	-	-	A	-
Fluosilicate Bath 95°F	A	C	D	-	A	-	-	D	D	D	-	C	A	C	-	D	C	-	C	C	A	D	-	B	C	D	D	D	-	-	-	-	-	-	B	-
Fluoride Bath 130°F	A	C	A	-	A	-	-	D	D	D	-	C	A	D	-	D	C	-	D	C	A	D	-	B	C	D	D	D	-	-	-	-	-	-	B	-
Black Chrome Bath 115°F	A	C	A	-	A	-	-	D	D	D	-	C	A	C	-	D	A	-	C	A	A	D	-	A	C	C	D	C	-	-	-	-	-	-	A	-
Barrel Chrome Bath 95°F	A	C	A	-	A	-	-	D	D	D	-	C	A	D	-	D	C	-	D	C	A	D	-	A	C	D	D	D	-	-	-	-	-	-	A	-
Copper Plating (Cyanide)																																				
Cu Strike Bath 120°F	A	B	A	-	A	-	A	A	A	A	-	B	A	A	-	-	-	-	-	A	-	A	-	C	A	A	A	A	-	-	-	-	-	-	C	-
Rochell Salt Bath 150°F	D	C	A	-	D	-	-	A	A	B	-	A	A	A	-	C	D	-	-	A	A	A	-	D	A	A	B	A	-	-	-	-	-	-	D	-
High-Speed Bath 180°F	D	C	A	-	D	-	-	A	A	B	-	A	A	A	-	C	D	-	-	A	A	A	-	D	A	A	B	A	-	-	-	-	-	-	D	-
Copper Plating (Acid)																																				
Copper Sulfate Bath R.T.	A	D	A	-	A	-	-	D	A	A	-	A	A	D	-	D	A	-	D	A	A	D	-	A	A	A	A	A	-	-	-	-	-	-	A	-
Copper Fluoborate Bath 120°F	A	D	A	-	A	-	A	D	A	C[1]	-	A	A	D	A	D	D	-	D	D	A	D	-	D	A	B	C	B	-	-	-	-	-	-	D	-

Derlin,Hypolon,Neoprene,Teflon,Biton-
Reg TM E.I. du Pont de Nemours & Co
KelF-Reg TM Minnesota Mining & Mfg. Co

Ryton-Reg TM Phillips Petrolum Co
Tygon-Reg TM Norton Co
Noryl-Reg TM General Electric Co

Kynar-Reg TM Penwalt Corp
Cycolac-Reg TM Mar-Bon Corp

Ratings-chemical effect

A - No effect - Excellent
B - Minor effect - Good
C - Moderate effect - Fair
D - Sever effect - Not recommended

Explanation of footnotes

1. **Satisfactory to 72°F**
2. **Satisfactory to 120°F**
3. **Satisfactory for O-rings**

	CPVC	Epoxy	Polypropylene	Polyethylene	PVC	Cyolac ® (ABS)	Phenolic	Nylon	Noryl ®	Delrin ® (Acetal)	Ryton ® to 200°F	Kynar ® (PVDDF)	Teflon ®	Stainless steel (316)	Stainless steel (304)	Stainless steel (440)	Titanium	Carpenter 20	Cast bronze	Cast iron	Aluminum	Hastelloy C	Carbron.ceramic	Caramagnet A	Viton ®	Buna N	Neoprene ®	Nitrile	Natural rubber	Hypalon ®	EPDM	Kel-F®	Tygon	Silicone	Ceramic	Carbon/graphite
Copper Plating (Misc)																																			
Copper Pyrophosphate	A	B	A	-	A	-	-	A	A	A	-	A	A	A	-	B	A	-	A	A	A	A	-	B	A	A	A	A	-	-	-	-	-	B	-
Copper (Electroless)	A	B	A	-	A	-	-	A	A	D	-	A	A	-	-	B	A	-	-	-	A	-	-	A	A	D	D	D	-	-	-	-	D	-	A	-
Gold Plating																																			
Cyanide 150°F	D	D	A	-	D	-	-	A	A	-	-	-	A	A	-	-	A	-	-	-	-	A	-	-	A	A	A	A	-	-	-	-	-	B	-
Neutral 75°F	A	A	A	-	A	-	-	A	A	-	-	-	A	C	-	-	A	-	-	-	-	A	-	-	A	A	A	A	-	-	-	-	-	A	-
Acid 75°F	A	A	A	-	A	-	-	A	A	-	-	-	A	C	-	-	A	-	-	-	-	A	-	-	A	A	A	A	-	-	-	-	-	A	-
Indium Sulfamate Plating R.T.	A	A	A	-	A	-	-	D	A	-	-	-	A	C	-	-	A	-	-	-	-	A	-	-	A	A	A	A	-	-	-	-	-	A	-
Iron Plating																																			
Ferrous Chloride Bath 190°F	D	D	C	-	D	-	A	D	A	-	-	-	A	D	-	-	A	-	-	-	-	D	-	-	A	B	D	B	-	-	-	-	-	A	-
Ferrous Sulfate Bath 150°F	D	D	A	-	D	-	A	D	A	-	-	-	A	C	-	-	A	-	-	-	-	A	-	-	A	A	B	A	-	-	-	-	-	A	-
Ferrous Am Sulfate Bath 150°F	D	D	A	-	D	-	A	D	A	-	-	-	A	C	-	-	A	-	-	-	-	A	-	-	A	A	B	A	-	-	-	-	-	A	-
Sulfate-Chloride Bath 160°F	D	D	A	-	D	-	A	D	A	-	-	-	A	D	-	-	A	-	-	-	-	D	-	-	A	B	C	B	-	-	-	-	-	A	-
Fluoborate Bath 145°F	D	D	A	-	D	-	-	D	A	-	-	-	A	D	-	-	D	-	-	-	-	B	-	-	A	B	C	B	-	-	-	-	-	D	-
Sulfamate 140°F	A	A	A	-	A	-	-	D	A	-	-	-	A	D	-	-	A	-	-	-	-	B	-	-	A	A	A	A	-	-	-	-	-	A	-
Lead Fluobrorate Plating	A	A	A	-	A	-	A	D	A	-	-	-	A	C	-	-	D	-	-	-	-	A	-	-	A	B	A	B	-	-	-	-	-	D	-
Nickel Plating																																			
Watts Type 115-160°F	D	D	A	-	D	-	-	A	A	-	-	-	A	C	-	-	A	-	-	-	-	A	-	-	A	A	A	A	-	-	-	-	-	A	-
High-Chloride 130-160°F	D	D	A	-	D	-	-	D	A	-	-	-	A	C	-	-	A	-	-	-	-	A	-	-	A	A	B	A	-	-	-	-	-	A	-
Fluoborate 100-170°F	A	A	A	-	A	-	A	D	A	-	-	-	A	C	-	-	D	-	-	-	-	A	-	-	A	B	A	B	-	-	-	-	-	D	-
Sulfamate 100-140°F	A	A	A	-	A	-	-	A	A	-	-	-	A	C	-	-	A	-	-	-	-	A	-	-	A	A	A	A	-	-	-	-	-	A	-
Electroless 200°F	D	B	D	-	D	-	-	D	D	-	-	-	A	-	-	-	-	-	-	-	-	-	-	-	A	D	D	D	-	-	-	-	-	A	-
Rhodium Plating 120°F	A	A	A	-	A	-	-	D	A	-	-	-	A	D	-	-	D	-	-	-	-	D	-	-	A	A	B	A	-	-	A	-	-	A	-
Silver Plating 80-120°F	A	A	A	-	A	-	A	A	A	-	-	-	A	A	-	-	A	-	-	-	-	A	-	-	A	A	A	A	-	-	A	-	-	B	-
Tin-Fluoborate Plating 100°F	A	A	A	-	A	-	A	D	A	-	-	-	A	C	-	-	D	-	-	-	-	A	-	-	A	B	C	B	-	-	-	-	-	D	-
Tin-Lead Plating 100°F	A	A	A	-	A	-	-	D	A	-	-	-	A	C	-	-	D	-	-	-	-	A	-	-	A	B	C	B	-	-	-	-	-	D	-
Zinc Plating																																			
Acid Chloride 140°F	A	A	A	-	A	-	-	D	A	-	-	-	A	D	-	-	A	-	-	-	-	D	-	-	A	A	A	A	-	-	-	-	-	A	-
Acid Sulfate Bath 150°F	D	D	A	-	D	-	A	D	A	-	-	-	A	C	-	-	A	-	-	-	-	A	-	-	A	A	B	A	-	-	-	-	-	A	-
Acid Fluoborate Bath R.T.	A	A	A	-	A	-	A	D	A	-	-	-	A	C	-	-	D	-	-	-	-	A	-	-	A	B	C	B	-	-	-	-	-	D	-
Alkaline Cyanide Bath R.T.	A	A	A	-	A	-	A	A	A	-	-	-	A	A	-	-	A	-	-	-	-	A	-	-	A	A	A	A	-	-	-	-	-	D	-
Potash	C	A	A	B	C	-	C	A	A	B	-	-	-	A	A	-	-	A	D	C	C	B	A	A	A	A	A	A	B	-	-	-	B	-	A	-
Potassium Bicarbonate	A	A	A	A	A	C	A	A[1]	A[1]	C	A	B	A	B	B	B	A	B	D	A	D	B	A	-	A	A	A	A	B	-	-	A	-	-	A	A
Potassium Bromide	A	A	A	A	A	-	-	A[1]	A[1]	A	A	A	A	B	C	B	A	B	C	-	B	B	A	-	A	A	A	A	B	-	A	A	-	A	A	A
Potassium Carbonate	A	A	A	A	A	-	A	A[1]	A[1]	B	A	A	A	B[1]	B	B	A[1]	B	D	A	D	B	A	A	A	A	A	A	B	-	A	A	-	A	A	A
Potassium Chlorate	A	A	A	A	A	-	-	C[1]	A[1]	B	A	A	A	B[1]	B	B	A	B[1]	B	-	B	C	A	-	A	C	A	C	B	-	A	A[2]	-	-	-	A
Potassium Chloride	A	A	A	A	A	C	A	B[1]	A[1]	A	A	A	A	B[1]	A[1]	B[1]	A	A[1]	D	A	D	B	A	-	A	A	A	A	A	A	A	A	B	C	D	C
Potassium Chromate	A	C	A	A	A	-	D	A	A[2]	C	-	B	A[1]	B[1]	B[1]	B[1]	-	B[1]	A	A	B[1]	A	A	-	A	A	A	A	B	-	A	-	C	A	A	A
Potassium Cyanide Solutions	A	A	A	A	A	-	D	A[1]	A[1]	C	A	A	A	B[1]	B[1]	B[1]	A	B	D	A	B[1]	A[1]	A	-	A	A	A	A	A	A	A	A	-	A	A	A
Potassium Dichromate	A	C	A	A	A	-	D	D	A[1]	C	A	A	A	B	B[1]	B	A	B[1]	A	A	D	B[1]	B	-	A	A	A	A	B	A	A	A	-	A	A	A
Potassium Ferrocyanide	B	A	A	A[1]	B	-	-	B[1]	A	-	-	A	A	B	B	C	A	B[1]	A	-	-	-	A	-	A	A	-	A	A	-	A	A	-	-	-	A
Potassium Hydroxide (Caustic Potash)	A[1]	A	A	A	A[1]	C	C	C[1]	A[1]	D	A	A	A	B	B[1]	B[1]	D	B[1]	D	-	A	A	B	A	B	B	B	B	B	A	A	B	C	D	C
Potassium Nitrate	A	A	A	B	A	-	-	B[1]	A[1]	B	A	A	A	B	B	B	A	B[1]	B	A	B	B	B	-	A	A	A	A	A	A	A	-	C	A	A	A
Potassium Permanganate	A[1]	A	A[1]	A	A[1]	C	A	D	A	C	A	A	A	B[1]	B	B[1]	A	B	C	A	B[1]	A[1]	A	-	A	C	A	C	B	-	A	-	-	-	A	A
Potassium Sulfate	A	A	A	A[2]	A[2]	-	A	A[1]	A	B	A	A	A	B[1]	B	B[1]	A	A[1]	C	A	D	B[1]	A	-	A	A	A	A	B	B	A	A[1]	A	A	A	A
Potassium Sulfide	A[2]	-	A	A[2]	A[2]	-	-	-	A	-	-	-	A	A[1]	B	B	A	A	-	-	-	-	-	-	A	A	A	A	B	B	A	A	-	A	-	A
Propane (liquefied)	A[1]	A	B[1]	C[1]	A[1]	-	-	A[1]	A[1]	A	-	A	A	A	A	A	-	A[2]	A	-	A	A	A	-	A	A	B	A	D	B	D	A	-	D	A	A
Propylene Glycol	C	C	A[2]	B[2]	C[1]	B	A	-	-	B	-	-	A	B	B	-	A	A	A	A	B	B	A	-	A	A	C	A	-	-	-	-	-	A	-	-
Pyridine	D	A	A[2]	B[1]	D	-	D	C[1]	B	A	A	C[2]	A	A	A	B	B	A	D	A	B	B	A	-	D	D	D	D	D	D	B	A[1]	D	D	A	A
Pyrogallic Acid	A	A	A	-	A	-	-	-	-	D	-	B	A	B[2]	B	B	A	B[1]	B	-	B	B	A	-	A	-	-	-	-	-	-	A	-	-	A	A
Rosins	C[1]	A	A[2]	B[1]	C[1]	-	-	A[1]	-	B	-	-	-	A[1]	A[1]	B	-	B	B	-	B[1]	-	A	-	-	A	-	A	-	-	-	A	-	-	A	A
Rum	A	A	A	-	A	-	A	A	A	A	-	-	-	A	A	-	-	A	-	-	-	-	A	-	A	A	A	A	-	-	-	-	-	A	-
Rust Inhibitors	-	A	A	-	-	-	B	-	-	A	-	-	-	A	A	-	-	A	B	C	-	-	A	-	A	A	C	A	-	-	-	-	-	A	-
Salad Dressings	-	A	A	-	-	-	-	A	A	A	-	-	-	A	A	-	-	-	B	D	B	-	A	-	A	A	-	A	-	-	-	-	-	A	-
Sea Water	A	A	A	A[2]	A[2]	-	A	A[2]	A[1]	A	A	A	A	A	C	C	A	A	A	-	B	A	A	C	A	A	A	A	A	A	A	A	-	A	A	A
Shellac (Bleached)	-	A	A	A[1]	-	-	-	A[1]	-	A	-	-	A	A	A	A	-	A	A	A	A	-	-	-	-	A	D	A	-	-	-	-	-	-	A	A
Shellac (Orange)	-	A	A	A[1]	-	-	-	A[1]	-	A	-	-	A	A	A	A	-	A	A	A	A	-	-	-	-	A	D	A	-	-	-	-	-	-	A	A
Silicone	A	A	A	-	A	-	D	A[1]	A[1]	A	A[1]	-	A	A	B	-	-	-	A	A	A	-	-	-	A	A	A	A	A	A	A	-	-	C	A	A
Silver Bromide	-	A	-	-	-	-	-	-	A	C	-	-	A	A	D	D	-	A	-	-	D	A	A	-	-	-	-	-	-	-	-	A	-	-	-	-
Silver Nitrate	A[1]	A	A[1]	B[2]	A[1]	-	A	A[1]	A	A	A	A	A	B	A	B	A	B	D	D	D	A	A	-	A	B	A	B	A	A	A	A	B	A	A	A

Derlin,Hypolon,Neoprene,Teflon,Biton-
Reg TM E.I. du Pont de Nemours & Co
KelF-Reg TM Minnesota Mining & Mfg. Co

Ryton-Reg TM Phillips Petrolum Co
Tygon-Reg TM Norton Co
Noryl-Reg TM General Electric Co

Kynar-Reg TM Penwalt Corp
Cycolac-Reg TM Mar-Bon Corp

MATERIAL COMPATIBILITY

3.47 | Guide Only

Ratings-chemical effect

- **A - No effect - Excellent**
- **B - Minor effect - Good**
- **C - Moderate effect - Fair**
- **D - Sever effect - Not recommended**

Explanation of footnotes

1. **Satisfactory to 72°F**
2. **Satisfactory to 120°F**
3. **Satisfactory for O-rings**

	CPVC	Epoxy	Polypropylene	Polyethylene	PVC	Cyolac ® (ABS)	Phenolic	Nylon	Noryl ®	Delrin ® (Acetal)	Ryton ® to 200°F	Kynar ® (PVDDF)	Teflon ®	Stainless steel (316)	Stainless steel (304)	Stainless steel (440)	Titanium	Carpenter 20	Cast bronze	Cast iron	Aluminum	Hastelloy C	Carbron.ceramic	Caramagnet A	Viton ®	Buna N	Neoprene ®	Nitrile	Natural rubber	Hypalon ®	EPDM	Kel-F®	Tygon	Silicone	Ceramic	Carbon/graphite
Soap Solutions	A	A	A	C[2]	A	-	A	A[1]	A[1]	A	A	A	A	A	A[1]	A	A	A	C	A	C	A	A	A	A	A	A	A	B	A	A	-	B	A	A	A
Soda Ash (see Sodium Carbonate)																																				
Sodium Acetate	A	A	A	B[2]	B[1]	-	-	B[1]	A[1]	B	A	A	A	B	B[1]	B[1]	A	B	A	-	B	A	A	-	D	B	B	B	A	D	A	A	-	D	A	A
Sodium Aluminate	-	A	-	-	-	-	-	A[1]	A	B	A	-	A	A	A	-	A	A	B	-	-	B	A	-	A	A	A	A	B	-	A	-	-	-	A	A
Sodium Bicarbonate	A[2]	A	A	A[2]	A[2]	B	A	A	A	A	A	A	A	B	A[1]	B	A[2]	A	A	C	D	B[1]	A	A	A	B	B	B	A	D	A	A	B	D	A	A
Sodium Bisulfate	A[2]	A	A	A[2]	A[2]	C	A	A[1]	A[1]	B	A	A	A	B[1]	D	D	A	A[2]	C	D	D	B[2]	A	-	A	B	C	B	A	-	A	A[2]	B	-	A	A
Sodium Bisulfite	A[2]	A	A	A[2]	A[2]	B	D	C[1]	A[1]	B	A	A	A	B[1]	B[1]	C	A	B[1]	C	D	D	B	A	-	A	A	A	A	A	A	A	-	B	A	A	A
Sodium Borate (Borax)	A[2]	A	A[2]	A[2]	A[2]	-	-	A[1]	A[1]	-	A	A	A	B[2]	C	A	A	A	A	-	C	A	-	-	A	A	A	A	A	A	A	-	-	A	-	A
Sodium Carbonate	A[2]	C[1]	A	B[2]	A[2]	C	A	B[1]	A	A[1]	A	A	A	A	B	B[1]	A[1]	A[2]	B	A	D	A	B	-	A	A	A	A	A	A	A	A	B	A	A	A
Sodium Chlorate	A[1]	A	A	B[2]	A[2]	-	-	D	A[1]	A	A	A	A	B[1]	B[1]	B	A	B[1]	B	-	C[1]	B[1]	A	-	A	C	A	C	A	A	A	-	B	-	A	C
Sodium Chloride	A[2]	A	A	A[2]	A[2]	B	A	A[1]	A	A[1]	A	A	A	C	B	C	A	B	C	A	C	A	A	A	A	A	A	A	A	A	A	A	B	A	A	A
Sodium Chromate	-	C	-	-	-	-	D	D	A	D	A	-	A	B[1]	B	B	-	B	A	A	B	A	A	-	A	A	A	A	-	-	-	A	-	-	B	A
Sodium Cyanide	A[2]	A	A	A[2]	A[2]	-	A	A[1]	A[1]	A	A	A	A	A[1]	B[1]	A[1]	A	A	D	A	D	A	A	-	A	A	A	A	A	A	A	A	-	A	A	A
Sodium Fluoride	A[2]	A	A	A[2]	A[2]	-	-	B	A[2]	-	-	A	A[1]	D	D	C[1]	A	C	C	-	B	A	-	-	A	A[1]	D	A[1]	D	-	A	-	D	-	-	A
Sodium Hydrosulfite	C	-	-	-	C	-	-	A	-	-	-	-	A	-	-	-	-	-	C	-	A	A	-	-	A	-	A	-	A	-	-	-	-	A	-	-
Sodium Hydroxide (20%)	A	A[2]	A	A[2]	A	C	C	A	A	A	A	-	A	A	B[2]	A[2]	A[1]	A	D	A	D	B	C	A	B	B	B	B	A	A	A	A	B	B	D	A[2]
Sodium Hydroxide (50%)	A	B[2]	A	A[2]	A	C	D	A	A	C	A	A	A	B	B[1]	B	B[1]	B	D	C	D	B	C	C	B	B	B	B	A	A	A	A	B	B	D	A[2]
Sodium Hydroxide (80%)	A	A[1]	A	B[2]	A	C	D	C	A	D	A	-	A[1]	C	B[1]	B	D	B	D	C	D	A[1]	C	C	B	B	B	B	A	A	A	A	C	C	D	A[2]
Sodium Hypochlorite (<20%)	C[2]	C	B	A	A	-	D	D	A	D	A	A	A	C	C	D	C	C	D	D	D	A	D	B	A	B	B	B	C	B	B	A	C	B	A	B
Sodium Hypochlorite (100%)	C[2]	D	B	B[2]	C[2]	-	D	D	A	D	A	A	A	D	D	D	C	C	D	D	D	B	B	-	A	B	B	B	C	B	B	A	-	B	D	C
Sodium Hyposulfate	-	C	-	-	-	-	-	-	-	-	-	-	A	A	A	-	-	-	D	-	D	-	-	-	-	-	C	-	C	-	-	-	-	-	-	-
Sodium Metaphosphate	A[1]	A	A[1]	A[1]	B[2]	-	A	A[1]	-	B	-	-	A	A	A	B	-	A	C	D	C	-	A	-	A	A	B	A	A	B	A	-	-	-	A	A
Sodium Metasilicate	A	A	A	-	A	-	-	-	-	D	-	-	A	A	A	A	-	A	B	-	D	A	A	-	A	A	A	A	-	-	A	-	-	-	-	-
Sodium Nitrate	A	A	A	A[2]	A[2]	-	A	A[1]	A[1]	A	A	A	A	B[1]	B[1]	B[1]	A	B	C	A	B	B	A	A	A	B	B	B	B	A	A	A	B	D	A	C
Sodium Perborate	A[1]	B	A	A[1]	A[2]	-	A	B[1]	A	B	-	-	A	B	B	B	-	B	D	C	C	B	A	-	A	B	B	B	B	B	A	A	-	B	A	C
Sodium Peroxide	A[2]	C	B	A	B[2]	-	D	A[1]	-	D	-	A	A	A	A	B	-	A	D	C	C	B	A	-	A	B	B	B	B	B	A	A	-	D	A	A
Sodium Polyphosphate	A[1]	A	A	A	A[1]	-	A	A[1]	A[1]	B	-	A	A	B	B	B	A	B	C	D	D	A	A	-	A	A	B	A	A	A	A	A	-	D	A	A
Sodium Silicate	A[2]	A	A	A[2]	A[2]	-	A	A[1]	A[1]	C	A	A	A	A	B	B	A	B	A	A	D	B	A	-	A	A	A	A	A	A	A	A	B	-	A	A
Sodium Sulfate	A[2]	A	A	A[2]	A[2]	-	A	A	A	B	A	A	A	B	B[1]	D	A	B	C	A	A	B	A	-	A	A	A	A	B	A	A	A	-	A	A	A
Sodium Sulfide	A[2]	A	A	A[2]	A[2]	-	D	A[1]	A	B	A	A	A	B	D	D	A	B[1]	D	A	D	B[1]	A	-	A	A	A	A	B	A	A	A[1]	B	A	A	A	A
Sodium Sulfite	A[2]	A	A[2]	B[1]	A[2]	-	A	D	A	-	-	A	A	B	A	C[1]	A	B	C	A	C[1]	B	A	-	A	A	A	A	B	A	A	A	A	A	A	A
Sodium Tetraborate	A	A	-	A[2]	A[2]	-	-	A	A	B	-	-	A	A[2]	A	C	-	A	-	-	C	-	A	-	A	A	-	A	-	-	-	-	-	-	A	A
Sodium Thiosulfate (hypo)	A[2]	A	A[2]	A	A[2]	-	A	B	A	C[1]	A	A	A	A[2]	B	C	A	A[2]	D	C	A	A[2]	A	-	A	B	A	B	B	A	A	A	-	A	A	A
Sorghum	-	A	-	-	-	-	D	A	-	A	-	-	-	A	A	-	-	A	D	A	-	-	A	-	A	A	A	A	-	-	-	-	-	-	A	-
Soy Sauce	-	A	-	-	-	-	D	A	A	A	-	-	-	A	A	-	-	A	A	D	A	-	A	-	A	A	A	A	D	-	-	-	-	-	A	-
Stannic Chloride	A[2]	A	A	A[2]	A[2]	-	-	B[1]	A[1]	C	A	A	A	D	D	D	A	A	D	D	D	B	-	-	A	A	D	A	A	D	B	A	-	B	A	A
Stannic Fluoborate	-	A	-	-	-	-	A	-	A	C	-	-	-	A	-	-	-	-	D	D	-	-	-	-	A	A	A	A	-	-	-	-	-	-	A	-
Stannous Chloride	A[2]	A	A	B[2]	A[1]	-	-	C[1]	A[2]	-	A[1]	A	A	A[2]	C[2]	C[1]	A	A[1]	D	-	D	B	-	-	A	A	A	A	A	A	A	A	A	B	-	-
Starch	A	A	A[2]	B	A	-	A	A[1]	A[2]	A	-	-	A	A	A	-	-	-	A	C	A	-	A	-	A	C	A	C	-	-	A	A	-	-	A	A
Stearic Acid	B[2]	B	A[2]	B[1]	B[2]	-	D	A[2]	A	A	-	A	A	A	B	B	A	B	C	C	B	B	A	A	A	B	B	B	B	B	B	-	B	B	A	A
Stoddard Solvent	C[1]	A	C	C[2]	C[1]	B	D	A	D	A	A	A	A	A	A	-	A	A	A	A	A	A	A	-	A	A	C	A	D	D	D	A	C	D	A	A
Styrene	D	A	-	-	D	-	D	A[1]	A	A	-	-	A	A	A	-	-	A	A	-	A	D	A	-	B	D	D	D	D	D	D	-	-	D	A	A
Sugar (Liquids)	-	A	A	-	-	B	-	A[1]	A[2]	A	-	-	A	A	A	A	-	A	A	-	A	A	A	A	A	A	B	A	A	B	A	-	B	A	A	A
Sulfate (Liquors)	B[2]	A	A	A[2]	B	-	D	B[1]	-	D	-	A	A	B	B	A	-	B	D	D	D	B	A	-	A	A	A	A	-	-	A	-	-	-	A	A
Sulfur Chloride	C[1]	C	C[1]	C[1]	C[1]	-	-	A[1]	A	D	-	A[1]	A	D	D	D	D	B	D	D	D	A	C	-	A	D	D	D	D	D	D	A	C	C	C	D
Sulfur Dioxide	A[2]	A[1]	A[1]	B[1]	A[1]	D	-	C	A	B	A	A	A	A[1]	D	D	A	B	B	-	B	C	A	-	A	D	B	D	B	C	A	A	C	B	A	A
Sulfur Dioxide (dry)	A[2]	A[1]	A[1]	A[1]	A[2]	-	A	B[1]	A	B	A	A	A	A	D	D	A	B	A	A	B	B	A	-	A	D	D	D	B	D	A	A	C	B	A	A
Sulfur Trioxide (dry)	A	A	D	C[1]	A[1]	-	-	A[1]	D	D	-	C[1]	A	A	D	D	D	B	B	-	A	B	B	-	A	D	D	D	B	D	B	-	B	B	A	D
Sulfuric Acid (<10%)	A	A[1]	A[2]	A[1]	A[1]	B	D	C[1]	A	D	A	A	A	B	D	C	D	B	D	D	D	B[1]	A	-	A	D	B	D	C	C	B	A	B	D	A	A[1]
Sulfuric Acid (10-75%)	A	A[1]	A[1]	A[1]	A[1]	B	D	D	A	D	A	A	A	D	D	D	D	B	D	D	D	B[1]	A	C	A	D	C	D	C	C	B	A	-	D	D	A[1]
Sulfuric Acid (75-100%)	C	C[1]	C[1]	B[1]	D	-	D	D	A	-	A[1]	A	A	D	D	D	D	B	D	D	D	B[1]	-	-	A	D	D	D	D	B	B	A	D	D	A	C[1]
Sulfuric Acid (cold concentrated)	D	D	D	D	D	-	D	D	D	-	D	C	A	C	D	B	D	B	D	D	D	D	-	-	A	D	D	D	D	D	D	A	D	D	-	D
Sulfuric Acid (hot concentrated)	D	D	A[2]	C	D	-	D	D	A	-	A[1]	A	A	B	C	C	D	B	D	D	B	A[1]	D	-	A	D	D	D	D	B	B	A	D	D	-	D
Sulfurous Acid	A[2]	A	A	B[2]	A[2]	-	-	D	A	C	A	A	A	B	B[1]	B[1]	A	B	D	D	B[1]	B	B	-	A	B	B	B	B	A	B	A	B	D	A	A
Sulfuryl Chloride	-	A	-	-	-	-	-	-	-	A	-	-	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	A	-
Tallow	-	A	A[2]	C	-	-	-	A[1]	A	A	-	-	A	A	A	-	-	-	-	-	A	-	A	-	A	A	-	A	-	-	-	-	-	-	A	A
Tannic Acid	A[1]	A	A	B[2]	A[1]	-	-	C[1]	A[2]	B	A	B	A	A	B[1]	B[1]	A	B	A	C	C	B[1]	A	A	A	A	B	A	A	B	A	A	B	B	A	A
Tanning Liquors	A[1]	A	A[1]	A[1]	A[1]	-	C	A[1]	A[2]	B	-	-	A	A[2]	A[2]	-	A	A[2]	A	-	A	B	A	-	A	A	A	A	-	-	B	-	B	-	A	A
Tartaric Acid	A[1]	A	A	A[1]	A[1]	-	A	B[2]	A[1]	B	A	B	A	C[2]	C[2]	C[1]	A[1]	B[1]	A	C	B[1]	B	A	-	A	A	B	A	A	A	B	A[2]	B	A	A	A	A
Tetrachloroethane	C	A	C	-	C	-	-	C[1]	D	A	-	A	A	A	B	-	A	-	-	-	C	A	A	-	A	D	-	D	D	-	-	A	-	A	-	-	A

Derlin,Hypolon,Neoprene,Teflon,Biton-
Reg TM E.I. du Pont de Nemours & Co
KelF-Reg TM Minnesota Mining & Mfg. Co

Ryton-Reg TM Phillips Petrolum Co
Tygon-Reg TM Norton Co
Noryl-Reg TM General Electric Co

Kynar-Reg TM Penwalt Corp
Cycolac-Reg TM Mar-Bon Corp

MATERIAL COMPATIBILITY

3.48 | Guide Only

Ratings-chemical effect

A - No effect - Excellent
B - Minor effect - Good
C - Moderate effect - Fair
D - Sever effect - Not recommended

Explanation of footnotes

1. **Satisfactory to 72°F**
2. **Satisfactory to 120°F**
3. **Satisfactory for O-rings**

	CPVC	Epoxy	Polypropylene	Polyethylene	PVC	Cyolac ® (ABS)	Phenolic	Nylon	Noryl ®	Delrin ® (Acetal)	Ryton ® to 200°F	Kynar ® (PVDDF)	Teflon ®	Stainless steel (316)	Stainless steel (304)	Stainless steel (440)	Titanium	Carpenter 20	Cast bronze	Cast iron	Aluminum	Hastelloy C	Carbron.ceramic	Caramagnet A	Viton ®	Buna N	Neoprene ®	Nitrile	Natural rubber	Hypalon ®	EPDM	Kel-F®	Tygon	Silicone	Ceramic	Carbon/graphite
Tetrachloroethylene	D	-	D	B	D	-	-	A[1]	D	A	-	-	A	A	-	-	-	-	-	-	-	-	-	-	A	D	D	D	D	D	D	A	-	-	-	A
Tetrahydrofuran	D	A	C[2]	C[1]	D	-	-	A	D	A	A	B[1]	A	A	A	-	B	A	D	-	-	A	A	A	D	D	D	D	D	D	B	A[1]	-	-	A	A
Toluene (Toluol)	D	B[1]	C[1]	C[1]	D	D	A	A[1]	D	C[1]	A	A[1]	A	A	A	A	A	A	A	A	A	A	A	-	A	D	D	D	D	D	D	B[2]	D	D	A	A
Tomato Juice	-	A	A	A[1]	A	B	-	A[1]	A	B	A	A	A	A	A	C	-	A	C	-	A	-	A	A	-	A	A	A	-	-	-	A	-	-	A	A
Trichloroethane	-	A	C	-	C	-	D	C[1]	D	A	-	A	A	A	B	-	A	A	A	A	C	A	A	A	A	D	D	D	D	D	D	A	-	D	A	A
Trichloroethylene	D	C[1]	C[1]	C[1]	D	D	A	C[1]	D	B	A	A[1]	A	B	B[2]	B	A	B	A	C	A[1]	B	A	C	A	C	D	C	D	D	D	A	-	D	A	A
Trichloropropane	-	A	-	-	-	D	D	-	D	A	-	-	A[1]	A	A	A	-	A	A	A	-	A	A	-	A	A	A	A	-	-	-	A	-	-	A	-
Tricresylphosphate	D	A	A[1]	B[1]	D	-	-	A[2]	A	C	-	D	A	A[2]	B	-	B	A[2]	A	-	D	A	A	-	B	D	D	D	D	D	A	-	-	C	A	A
Triethylamine	A	A	D	-	A	-	-	A[1]	B	D	-	A[2]	A	A	-	-	-	-	A	A	-	-	A	-	A	A	B	A	-	-	-	A	-	-	A	A
Turpentine	A	B	B[1]	C[1]	B[1]	-	-	A[1]	A[1]	A[2]	A	A	A	A	A	B	B	A	C	-	A	B	A	-	A	A	D	A	D	D	D	A	B	D	A	A
	A	A	A	A[2]	A	-	A	A[1]	A[2]	A	-	A	A[1]	A	A	-	-	A	C	A	B	-	A	-	A[1]	A[1]	D	A[1]	-	-	A[1]	-	-	-	A	A
Varnish	-	A	A	C[1]	D	-	A	C[1]	D	A	-	-	A	A	A	A	-	-	A	C	A	-	A	A	A	B	D	B	D	D	D	A	-	D	A	A
Vegetable Juice	-	A	-	-	-	-	A	A	A	A	-	-	-	C	A	-	-	A	C	D	A	-	A	-	A	C	C	C	D	-	-	-	-	-	A	-
Vinegar	A	A	A	B[2]	A[2]	B	-	C	A[1]	B	A	B	A	A	A	A	A	A	C	C	B	A	A	A	A	B	B	B	B	A	A	A	B	A	A	A
Water - Acid: Mine	A	A	A	A[2]	A[2]	B	-	B[1]	-	A[1]	A	B	A	A	A	C	A	A	C	C	C	A	A	-	A	A	C	A	B	-	A	A	B	B	A	A
Water - Distilled	A	A	A	A[2]	A[2]	A	A	A[1]	A	C	A	A	A	A	A	A	A	A	D	D	A	A	A	A	A	A	A	A	A	-	A	A	B	-	A	A
Water - Fresh	A	A	A	A[2]	A[2]	A	A	A[1]	A	A[2]	A	A	A	A	A	A	A	A[1]	A	A	B	A	A	A	A	A	A	A	A	-	A	A	B	B	A	A
Water - Salt	A	A	A	A[2]	A[2]	-	A	A[2]	A	A	A	A	A	B	B	C	A	A	D	A	B	A	A	A	A	A	A	A	A	-	A	A	B	-	A	A
Weed Killers	-	A	-	-	-	-	-	A	-	A	-	-	-	A	A	-	-	-	C	-	C	-	A	-	A	A	C	A	-	-	-	-	-	-	A	-
	-	A	-	-	-	-	-	-	-	A	-	-	-	A	A	-	-	-	-	-	B[1]	-	A	-	A	A	-	A	-	-	-	-	-	-	A	-
Wiskey & Wines	A[2]	B	A	C	A[2]	-	A	A[1]	A[2]	A	-	A	A	A	A	C	A	A	C	D	C[1]	-	A	-	A	A	A	A	A	A	A	A	C	A	A	A
White Liquor (Pulp Mill)	-	A	A[1]	A[2]	A[2]	-	A	A[1]	A[1]	D	-	A[1]	A	A	B	-	-	A	D	C	-	A	A	-	A	A	A	A	-	-	-	-	-	-	A	A
White Water (Paper Mill)	-	A	A	-	A	-	A	A	D	B	-	-	-	A	A	-	-	-	A	A	-	-	A	-	A	-	A	-	-	-	-	-	-	-	A	-
Xylene	-	A	C[1]	C[1]	D	D	A	A[2]	D	A	A	A	A	A	A	A	A	A	A	A	A[1]	A	A	A	A	D	D	D	D	D	D	A	D	D	A	A
Zinc Chloride	A	A	A	A[1]	A[2]	-	A	C[1]	A[1]	C	A	A	A	D	D	D	A[1]	B[1]	D	D	D	B	A	-	A	A	A	A	A	A	A	A	B	-	A	A
Zinc Hydrosulfite	-	A	-	-	-	-	A	A	A	C	A	-	-	A	A	-	-	-	D	D	D	-	A	-	-	A	A	A	-	-	A	-	-	-	A	-
Zinc Sulfate	A	A	A	A[2]	A[2]	-	A	C[1]	A[1]	C	A	A	A	B	B[1]	C[1]	A	B	C	C	D	B	A	-	A	A	A	A	B	A	A	A	B	A	A	A

Derlin,Hypolon,Neoprene,Teflon,Biton-
Reg TM E.I. du Pont de Nemours & Co
KelF-Reg TM Minnesota Mining & Mfg. Co

Ryton-Reg TM Phillips Petrolum Co
Tygon-Reg TM Norton Co
Noryl-Reg TM General Electric Co

Kynar-Reg TM Penwalt Corp
Cycolac-Reg TM Mar-Bon Corp

3.49 | Pipe Expansion Table

Coefficient	13	17.3	16	90	52	16.5
Material	Steel	Stainless Steel 304	Stainless Steel 316	ABS Thermoplastic	PVC Thermoplastic	Copper
Temp ˚C	mm/m	mm/m	mm/m	mm/m	mm/m	mm/m
-140	-2.12	-2.82	-2.61	-14.67	-8.48	-2.69
-120	-1.86	-2.47	-2.29	-12.87	-7.44	-2.36
-100	-1.60	-2.13	-1.97	-11.07	-6.40	-2.03
-80	-1.34	-1.78	-1.65	-9.27	-5.36	-1.70
-60	-1.08	-1.44	-1.33	-7.47	-4.32	-1.37
-50	-0.95	-1.26	-1.17	-6.57	-3.80	-1.20
-40	-0.82	-1.09	-1.01	-5.67	-3.28	-1.04
-30	-0.69	-0.92	-0.85	-4.77	-2.76	-0.87
-20	-0.56	-0.74	-0.69	-3.87	-2.24	-0.71
-15	-0.49	-0.66	-0.61	-3.42	-1.98	-0.63
-10	-0.43	-0.57	-0.53	-2.97	-1.72	-0.54
-5	-0.36	-0.48	-0.45	-2.52	-1.46	-0.46
0	-0.30	-0.40	-0.37	-2.07	-1.20	-0.38
5	-0.23	-0.31	-0.29	-1.62	-0.29	-0.30
10	-0.17	-0.22	-0.21	-1.17	-0.21	-0.21
20	-0.04	-0.05	-0.05	-0.27	-0.05	-0.05
23	0.00	0.00	0.00	0.00	0.00	0.00
30	0.09	0.12	0.11	0.63	0.36	0.12
40	0.22	0.29	0.27	1.53	0.88	0.28
50	0.35	0.47	0.43	2.43	1.40	0.45
60	0.48	0.64	0.59	3.33	1.92	0.61
70	0.61	0.81	0.75	4.23	2.44	0.78
75	0.68	0.90	0.83		2.70	0.86
80	0.74	0.99	0.91		2.96	0.94
90	0.87	1.16	1.07		3.48	1.11
100	1.00	1.33	1.23		4.00	1.27
110	1.13	1.51	1.39		4.52	1.44
120	1.26	1.68	1.55		5.04	1.60
130	1.39	1.85	1.71		5.56	1.77
140	1.52	2.02	1.87			1.93
150	1.65	2.20	2.03			2.10
160	1.78	2.37	2.19			2.26
170	1.91	2.54	2.35			2.43
180	2.04	2.72	2.51			2.59
190	2.17	2.89	2.67			2.76
200	2.30	3.06	2.83			2.92
220	2.56	3.41	3.15			3.25
240	2.82	3.75	3.47			
250	2.95	3.93	3.63			
260	3.08	4.10	3.79			
280	3.34	4.45	4.11			
290	3.47	4.62	4.27			
300	3.60	4.79	4.43			
320	3.86	5.14	4.75			
340	4.12	5.48	5.07			
360	4.38	5.83	5.39			
380	4.64	6.18	5.71			
400	4.90	6.52	6.03			
420	5.16	6.87	6.35			
440	5.42	7.21	6.67			
460	5.68	7.56	6.99			
480	5.94	7.91	7.31			
500	6.20	8.25	7.63			
520	6.46	8.60	7.95			
540	6.72	8.94	8.27			
560	6.98	9.29	8.59			
580	7.24	9.64	8.91			
600	7.50	9.98	9.23			
620	7.76	10.33	9.55			
640	8.02	10.67	9.87			
660	8.28	11.02	10.19			
680	8.54	11.37	10.51			
700	8.80	11.71	10.83			
720	9.06	12.06	11.15			
740	9.32	12.40	11.47			
760	9.58	12.75	11.79			

AS 2129 FLANGES

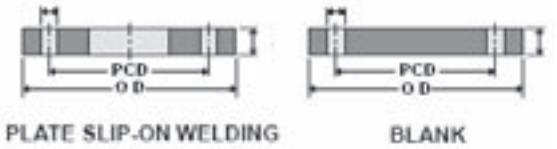


PLATE SLIP-ON WELDING BLANK

TABLE D

Nominal Bore Size	15	20	25	32	40	50	65#	80	100	125	150#	200#	250	300	350	400	450	500	600
OD OF FLANGE	95	100	115	120	135	150	165	185	215	255	280	335	405	455	525	580	640	705	825
PCD	67	73	83	87	98	114	127	146	178	210	235	292	356	406	470	521	584	641	756
THICKNESS*	5	5	5	6	6	8	8	10	10	13	13	13	16	19	22	22	25	29	32
No BOLTS	4	4	4	4	4	4	4	4	4	8	8	8	8	12	12	12	12	16	16
BOLT SIZE	M12	M12	M12	M12	M12	M16	M16	M16	M16	M16	M16	M16	M20	M20	M24	M24	M24	M24	M27
BOLT LENGTH***	45	45	45	50	50	60	60	60	65	65	65	70	75	85	100	95	100	110	120
WEIGHT Kg SOW	0.3	0.3	0.4	0.5	0.6	0.9	1.1	1.6	2.1	3.7	4.1	5.1	8.8	11.9	20.2	23.1	30.7	42.4	60.2

TABLE E

Nominal Bore Size	15	20	25	32	40	50	65#	80	100	125	150#	200#	250	300	350	400	450	500	600
OD OF FLANGE	95	100	115	120	135	150	165	185	215	255	280	335	405	455	525	580	640	705	825
PCD	67	73	83	87	98	114	127	146	178	210	235	292	356	406	470	521	584	641	756
THICKNESS*	6	6	7	8	9	10	10	11	13	14	17	19	22	25	29	32	35	38	48
No BOLTS	4	4	4	4	4	4	4	4	8	8	8	8	12	12	12	12	16	16	16
BOLT SIZE	M12	M12	M12	M12	M12	M16	M16	M16	M16	M16	M20	M20	M20	M24	M24	M24	M24	M24	M30
BOLT LENGTH***	45	45	45	50	50	60	60	60	65	65	70	75	75	90	100	95	100	110	140
WEIGHT Kg SOW	0.3	0.4	0.5	0.6	0.9	1.2	1.3	1.8	2.7	3.9	5.3	7.5	12.1	15.6	26.6	33.6	42.9	55.5	90.3

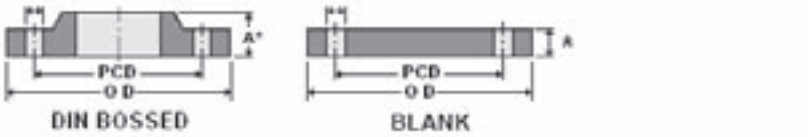
TABLE H

Nominal Bore Size	15	20	25	32	40	50	65#	80	100	125	150#	200#	250	300	350	400	450	500	600
OD OF FLANGE	115	115	120	135	140	165	185	205	230	280	305	370	430	490	550	610	675	735	850
PCD	83	83	87	98	105	127	146	165	191	235	260	342	381	438	495	552	610	673	781
THICKNESS*	13	13	14	17	17	19	19	22	25	29	29	32	35	41	48	54	60	67	76
No BOLTS	4	4	4	4	4	4	8	8	8	8	12	12	12	16	16	20	20	24	24
BOLT SIZE	M16	M16	M16	M16	M16	M16	M16	M16	M16	M20	M20	M20	M24	M24	M27	M27	M30	M30	M33
BOLT LENGTH***	60	60	60	65	65	75	75	75	85	100	100	100	120	120	130	140	160	150	180
WEIGHT Kg SOW	1	1	1.2	1.7	1.8	2.8	3.4	4.7	6.2	10.6	11.8	17.6	23.7	34.1	52.1	68.7	90.8	116	163

* THICKNESS OF PLATE FLANGE - NOTE IT IS NOT PRACTICAL TO PROVIDE PLATE FLANGES LESS THAN 12mm THICK
\# NOTE, THE EXACT OD OF PIPE MUST BE NOMINATED
*** LENGTHS OF BOLTS FOR PLATE STEEL FLANGES

OTHER NOTES: DIMENSIONS ARE IN MM
LARGER SIZES AVAILABLE ON REQUEST

BS 4504 PN16 FLANGES



DIN BOSSED BLANK

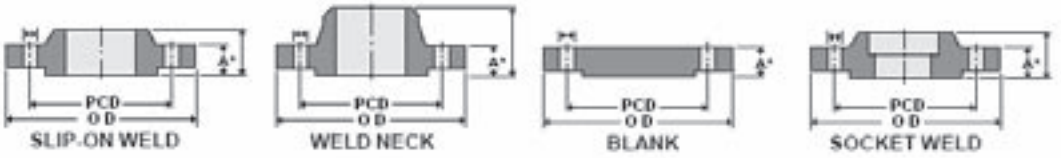
DIN - PN16

Nominal Bore Size	15	20	25	32	40	50	65	80	100	125	150#	200#	250	300	350	400	450	500	600
OD OF FLANGE	95	105	115	140	150	165	185	200	220	250	285	340	405	460	520	580	640	715	840
PCD	65	75	85	100	110	125	145	160	180	210	240	295	355	410	470	525	585	650	770
THICKNESS - A*	14	16	16	16	16	18	18	20	20	22	22	24	28	28	30	32	36	36	44
No BOLTS	4	4	4	4	4	4	4	8	8	8	8	12	12	12	16	16	20	20	20
BOLT SIZE	M12	M12	M12	M16	M16	M16	M16	M16	M16	M16	M20	M20	M24	M24	M24	M27	M27	M30	M33
BOLT LENGTH***	50	55	55	60	60	65	65	70	75	80	90	90	100	100	120	120	120	130	140
WEIGHT Kg SOW	0.7	1	1.2	1.7	1.9	2.4	3.2	4.1	4.4	5	7.3	9.3	10.1	14.5	24.5	28.8	31	42.8	53.5

* THICKNESS OF FLANGE INCLUDES BOSS FOR SLIP-ONS, BLANKS WILL BE WITHOUT BOSS
\# NOTE, THE EXACT OD OF PIPE MUST BE NOMINATED
*** LENGTHS OF BOLTS FOR PLATE STEEL FLANGES

OTHER NOTES: DIMENSIONS ARE IN MM
LARGER SIZES AVAILABLE ON REQUEST

FLANGE ASME B16.5 FORGED FLANGES



CLASS 150

Nominal Bore Size	15	20	25	32	40	50	65	80	100	125	150#	200#	250	300	350	400	450	500	600
OD OF FLANGE	90	100	110	120	130	150	180	190	230	255	280	345	405	485	535	600	635	700	815
PCD	60.5	70	79.5	89	98.5	121	140	153	191	216	242	299	362	432	476	540	578	635	750
MIN THICK - A*	11.5	13	14.5	16	17.5	19.5	22.5	24	24	24	25.5	29	30.5	32	35	37	40	43	48
HUB LENGTH SOW	16	16	17	21	22	25	29	30	33	36	40	44	49	56	57	64	68	73	83
HUB LENGTH W/N	48	52	56	57	62	64	70	70	76	89	89	102	102	114	127	127	140	145	152
BOLT HOLE DIA	16	16	16	16	16	20	20	20	20	22	22	22	26	26	30	30	33	33	36
No BOLTS	4	4	4	4	4	4	4	4	8	8	8	8	12	12	12	16	16	20	20
WEIGHT Kg SOW	0.5	0.7	1	1.1	1.4	2.2	3.8	4.1	5.9	6.1	8.2	12.7	17.2	27.2	35.4	42.2	52.6	65.3	91.6
WEIGHT Kg W/N	0.8	0.9	1.1	1.4	1.8	2.8	4.4	5.2	7.5	9.5	11.3	19.1	25.4	38.1	51.3	63.5	74.9	89.4	122

CLASS 300

Nominal Bore Size	15	20	25	32	40	50	65	80	100	125	150#	200#	250	300	350	400	450	500	600
OD OF FLANGE	95	120	125	135	155	165	190	210	255	280	320	380	445	520	585	650	710	775	915
PCD	66.5	82.5	89	98.5	115	127	149	169	200	235	270	330	388	451	515	572	629	686	813
MIN THICK - A*	14.5	16	17.5	19.5	21	22.5	25.5	29	32	35	37	41.5	48	51	54	57.5	60.5	63.5	70
HUB LENGTH SOW	22	25	27	27	30	33	38	43	48	51	52	62	67	73	76	83	89	95	106
HUB LENGTH W/N	52	57	62	65	68	70	76	79	86	98	98	111	117	130	143	146	159	162	168
BOLT HOLE DIA	16	20	20	20	22	20	22	22	22	22	22	26	30	33	33	36	36	36	42
No BOLTS	4	4	4	4	4	8	8	8	8	8	12	12	16	16	20	20	24	24	24
WEIGHT Kg SOW	0.7	1.3	1.4	2	2.8	3.1	4.5	6.1	9.5	12.7	16.3	25.4	35.4	50.8	72.2	95.3	115	139	222
WEIGHT Kg W/N	0.9	1.4	1.8	2.3	3.1	3.7	5.6	8.2	11.8	16.3	20	32.2	45.4	64.4	93.5	113	138	168	236

33 Alex Fisher Drive, Burleigh Heads Qld 4220
P.O. Box 2245 Burleigh Heads M.D.C Qld 4220 Australia
Ph: (617) 55934292 Fax: (617) 55934298
Email: phf@hoseflex.com.au Web: www.hoseflex.com.au