Isolation Equipment Index

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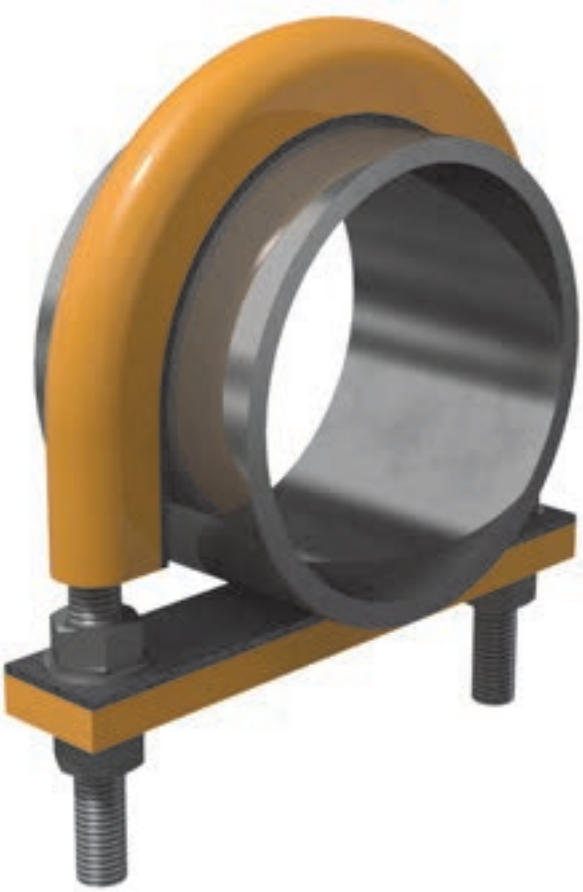


Isolation Equipment – Pictorial Index

Introduction

Isolation
QPS offers a wide range of isolating products to suit stainless steel, duplex, super duplex and cupro-nickel piping. These products incorporate moulded isolation / encasing materials such as:-

- Neoprene (temperature range -30°C to 100°C)
- VHT Silicone (temperature range -70°C to 350°C)

Both materials offer extensive performance qualities and can be utilised in a wide range of pipework installations.

Benefits

- Clamping damage restraint to thin wall pipes.
- Prevention of electrolytic erosion between dissimilar metals.
- Curtailment of noise and vibration.
- Cost effective and time saving.
- Wide range of standard products/sizes available.
- Bespoke sizes/designs available on request based on client's specification.

Properties and Isolating Material
The steel parts of both u-bolts and clamps are isolated from the pipe utilising either extruded 70/80 flame retardant neoprene (conforming to BS4255) or very high temperature flame retardant silicone.

70/80 FR Neoprene
This material is strong, resilient and achieves an extremely high performance in the reduction of noise and vibration in pipework. Neoprene also has an outstanding resistance to a wide range of chemicals, including; acids, alkalis, fats, oils, greases and solvents. It has advantageous physical properties including resistance to tear and abrasion, ozone and weathering.

• Working temperature range -30°C to 100°C
• Specific gravity 1.5
• Elongation at break 150 min, (%)
• Accelerated ageing
  ○ Hardness change IRHD plus 10 max.
  ○ Change T/S% minus 15% max.
  ○ Change in E/B% minus 40% max.
	• Hardness IRHD 76 – 85
	• Tensile strength 10.5 min. (Mpa)
	• Compression set 25% max.
	• Static ozone resistance – No cracks
	• Low temperature hardness change IRHD plus 12 max.
	• Colour: Black

VHT/FR Silicone
Silicone rubber is a chemically inert synthetic elastomer which differs from other synthetic and natural rubbers in that it is able to maintain excellent elasticity and resilience over a wide temperature range. It has excellent resistance to fire, very low toxicity and can perform at temperatures up to 300°C (max) with minimum loss of characteristics.

The material has excellent resistance to ozone, weathering and a wide range of chemicals, solvents, oils and greases.

• Working temperature range -70°C to 300°C • Density 1.44 (gms/cubic cm) • Elongation at break 165 (%) • Tear strength 10 (KN/M) • Flame resistance UL94 VO 2 mm • Oxygen index 39% (norm NFT 5107 1) • Colour: Grey	• Shore hardness 60 (A±5 deg) • Tensile strength 7.8 (Mpa) • Compression set 30% (70hrs @ 150°C) • Static ozone resistance – No cracks • Smoke toxicity to AFNOR norm NFX.70100 CT approx. 2.3 BS6853 category 1

Isolation Equipment – Fig. 111 & Fig. 112

Fig. 111 – Grip Isolation U-Bolt (C.S./S.S. Pipe)									
Pipe Size		A	B	C	D	E	H	WxT	Max Load Kg
NB	O/D								
15	21.3	60	60	37	6	60	11.5	25x10	220
20	26.9	65	60	43	6	70	14.5	25x10	220
25	33.7	65	60	50	6	75	17	25x10	220
32	42.4	80	75	69	10	95	21	25x10	545
40	48.3	80	70	75	10	100	24.5	25x10	545
50	60.3	90	75	87	10	110	30.5	25x10	545
65	76.1	95	75	102	12	135	38	30x10	1000
80	88.9	100	75	115	12	140	44.5	30x10	1000
100	114.3	110	75	141	12	170	57.5	30x10	1000
150	168.3	180	120	210	16	250	84	50x10	1635
200	219.1	200	120	262	16	315	109.5	50x10	1635
250	273	235	130	324	20	375	136.5	50x10	3405
300	323.9	265	130	375	20	425	162	50x10	3405

Fig. 111 – Grip Isolation U-Bolt (CuNi Pipe)								
Part No.	O/D	A	B	C	D	E	WxT	Max Load Kg
16	16	60	60	32	6	60	25x10	220
20	20	65	65	36	6	70	25x10	220
25	25	65	65	41	6	75	25x10	220
30	30	75	70	48	6	85	25x10	220
38	38	80	75	64	10	95	25x10	545
45	44.5	80	70	71	10	100	25x10	545
57	57	90	75	83	10	110	25x10	545
76	76.1	95	75	101	12	135	30x10	1000
89	88.9	100	75	115	12	140	30x10	1000
108	108	110	75	134	12	170	30x10	1000
159	159	180	120	201	16	250	50x10	1635
219	219.1	200	120	262	16	315	50x10	1635
267	267	235	130	318	20	370	50x10	3405
324	323.9	265	130	375	20	425	50x10	3405

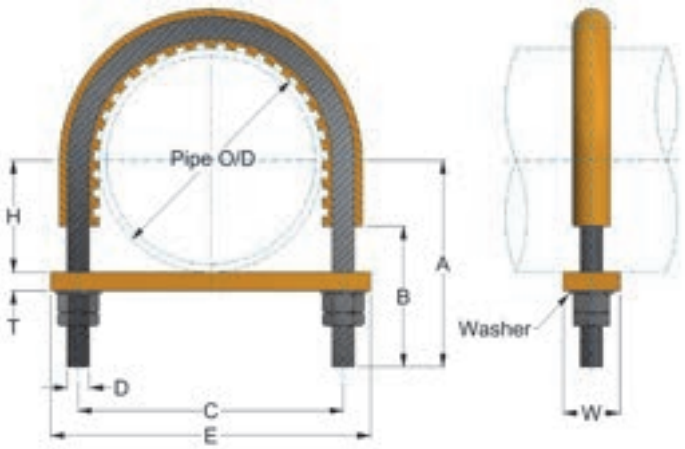


Fig. 111
Materials:
U-Bolt: Carbon Steel
Base Pad: 70/80 FR Neoprene
Sleeve: Extruded 70/80 FR Neoprene

2 x Full Nuts
2 x Locknuts
2 x Washers

Please Specify:-
- Figure Number:
- Part Number (CuNi):
- NB (CS/SS Lines):
- O/D (CuNi Lines):

Fig. 112 – U-Bolt with PTFE Lining (C.S./S.S. Pipe)										
Pipe Size		A	B	C	D	E	G	H	WxT	Max Load Kg
NB	O/D									
15	21.3	60	60	37	M6	60	21	10.5	25x10	220
20	26.9	65	60	43	M6	70	27	13.5	25x10	220
25	33.7	65	60	50	M6	75	34	17	25x10	220
32	42.4	80	75	69	M10	95	42	21	25x10	545
40	48.3	80	70	75	M10	100	49	24.5	25x10	545
50	60.3	90	75	87	M10	110	61	30.5	25x10	545
65	76.1	95	75	102	M12	135	76	38	30x10	1000
80	88.9	100	75	115	M12	140	89	44.5	30x10	1000
100	114.3	110	75	141	M12	170	115	57.5	30x10	1000
150	168.3	180	120	210	M16	250	168	84	50x10	1635
200	219.1	200	120	262	M16	315	219	109.5	50x10	1635
250	273	235	130	324	M20	375	273	136.5	50x10	3405
300	323.9	265	130	375	M20	425	324	162	50x10	3405

Fig. 112 – U-Bolt with PTFE Lining (CuNi Pipe)										
Part No.	O/D	A	B	C	D	E	G	H	WxT	Max Load Kg
16	16	60	60	32	M6	60	16	8	25x10	220
20	20	65	65	36	M6	70	20	10	25x10	220
25	25	65	60	41	M6	75	25	12.5	25x10	220
30	30	75	70	48	M6	85	30	15	25x10	220
38	38	80	75	64	M10	95	38	19	25x10	545
45	44.5	80	70	71	M10	100	45	22.5	25x10	545
57	57	90	75	83	M10	110	57	28.5	25x10	545
76	76.1	95	75	101	M12	135	76	38	30x10	1000
89	88.9	100	75	115	M12	140	89	44.5	30x10	1000
108	108	110	75	134	M12	170	108	54	30x10	1000
159	159	180	120	201	M16	250	159	79.5	50x10	1635
219	219.1	200	120	262	M16	315	219	109.5	50x10	1635
267	267	235	130	318	M20	370	267	133.5	50x10	3405
324	323.9	265	130	375	M20	425	324	182	50x10	3405

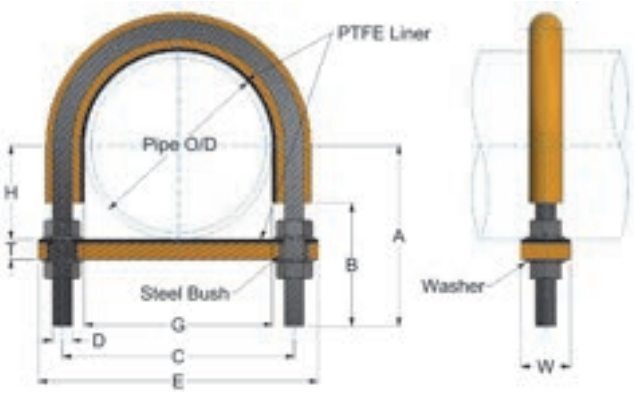


Fig. 112
Materials:
U-Bolt: Carbon Steel
Base Pad: 70/80 FR Neoprene
Sleeve: Extruded 70/80 FR Neoprene
PTFE: Etched & Bonded

4 x Full Nuts
4 x Washers
2 x Steel Bushes

Please Specify:-
- Figure Number:
- Part Number (CuNi):
- NB (CS/SS Lines):
- O/D (CuNi Lines):

Isolation Equipment – Fig. 113G & Fig. 113NG

Fig. 113G – Gripping Isolation U-Bolt (C.S. / S.S. Pipe)

Pipe Size		A	B	C	D	E	G	H	WxT	Max Load Kg
NB	O/D									
15	21.3	60	60	37	M6	60	21	10.5	25X10	220
20	26.9	65	60	43	M6	70	27	13.5	25X10	220
25	33.7	65	60	50	M6	75	34	17	25X10	220
32	42.4	80	70	69	M10	95	43	21	25X10	545
40	48.3	80	70	75	M10	100	49	24.5	25X10	545
50	60.3	90	75	87	M10	110	61	30.5	25X10	545
65	76.1	95	75	102	M12	135	76	38	30X10	1000
80	88.9	100	75	115	M12	140	89	44.5	30X10	1000
100	114.3	110	75	141	M12	170	115	57.5	30X10	1000
150	168.3	180	120	210	M16	250	168	84	50X10	1635
200	219.1	200	120	262	M16	315	219	109.5	50X10	1635
250	273	235	120	324	M20	375	273	136.5	50X10	3405
300	323.9	265	120	375	M20	425	324	162	50X10	3405

Fig. 113G – Gripping Isolation U-Bolt (CuNi Pipe)

Part No.	O/D	A	B	C	D	E	G	H	WxT	Max Load Kg
16	16	60	60	32	M6	60	16	8	25x10	220
20	20	65	65	36	M6	70	20	10	25x10	220
25	25	65	60	41	M6	75	25	12.5	25x10	220
30	30	75	65	46	M6	85	30	15	25x10	220
38	38	80	70	64	M10	95	38	19	25x10	545
45	44.5	80	70	71	M10	100	45	22.5	25x10	545
57	57	90	75	83	M10	110	57	28.5	25x10	545
76	76.1	95	75	102	M12	135	76	38	30x10	1000
89	88.9	100	75	115	M12	140	89	44.5	30x10	1000
108	108	110	75	134	M12	170	108	54	30x10	1000
159	159	180	120	201	M16	250	159	79.5	50x10	1635
219	219.1	200	120	262	M16	315	219	109.5	50x10	1635
267	267	235	120	318	M20	370	267	133.5	50x10	3405
324	323.9	265	120	375	M20	425	324	162	50x10	3405

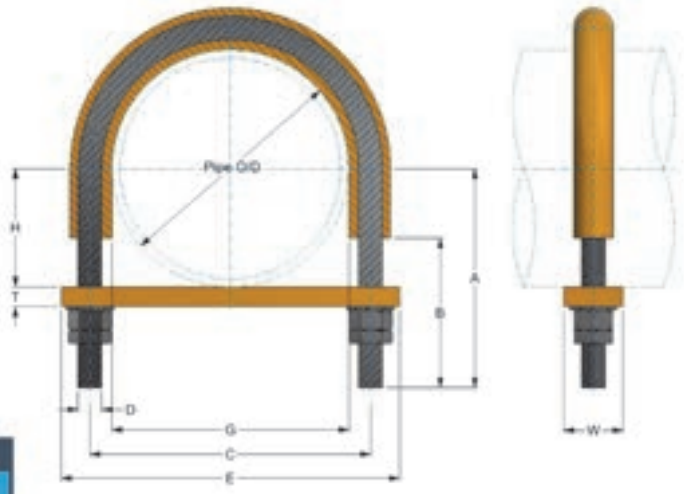


Fig. 113G
Materials:
U-Bolt: Carbon Steel
Base Pad: HT/FR Silicone
Sleeve: Extruded HT/FR Silicone

2 x Full Nuts
2 x Locknuts
2 x Washers

Please Specify:-
- Figure Number:
- Part Number (CuNi):
- Nominal Pipe Size:

Fig. 113NG – Non-Grip Isolation U-Bolt (C.S. / S.S. Pipe)

Pipe Size		A	B	C	D	E	G	H	WxT	Max Load Kg
NB	O/D									
15	21.3	60	60	37	M6	60	23	11.5	25x10	220
20	26.9	65	60	43	M6	70	29	14.5	25x10	220
25	33.7	65	60	50	M6	75	36	18	25x10	220
32	42.4	80	70	69	M10	95	45	22.5	25x10	545
40	48.3	80	70	75	M10	100	52	26	25x10	545
50	60.3	90	75	87	M10	110	64	32	25x10	545
65	76.1	95	75	102	M12	135	79	39.5	30x10	1000
80	88.9	100	75	115	M12	140	92	46	30x10	1000
100	114.3	110	75	141	M12	170	118	59	30x10	1000
150	168.3	180	120	210	M16	250	172	86	50x10	1635
200	219.1	200	120	262	M16	315	224	112	50x10	1635
250	273	235	130	324	M20	375	278	139	50x10	3405
300	323.9	265	130	375	M20	425	329	164.5	50x10	3405

Fig. 113NG – Non-Grip Isolation U-Bolt (CuNi Pipe)

Part No.	O/D	A	B	C	D	E	G	H	WxT	Max Load Kg
16	16	60	60	32	M6	60	18	9	25x10	220
20	20	65	65	36	M6	70	23	11.5	25x10	220
25	25	65	60	41	M6	75	28	14	25x10	220
30	30	75	70	48	M6	85	33	16.5	25x10	220
38	38	80	75	64	M10	95	41	20.5	25x10	545
45	44.5	80	70	71	M10	100	48	24	25x10	545
57	57	90	75	83	M10	110	60	30	25x10	545
76	76.1	95	75	102	M12	135	79	39.5	30x10	1000
89	88.9	100	75	115	M12	140	92	46	30x10	1000
108	108	110	75	134	M12	170	112	56	30x10	1000
159	159	180	120	201	M16	250	163	81.5	50x10	1635
219	219.1	200	120	262	M16	315	224	112	50x10	1635
267	267	235	130	318	M20	370	272	136	50x10	3405
324	323.9	265	130	375	M20	425	329	164.5	50x10	3405

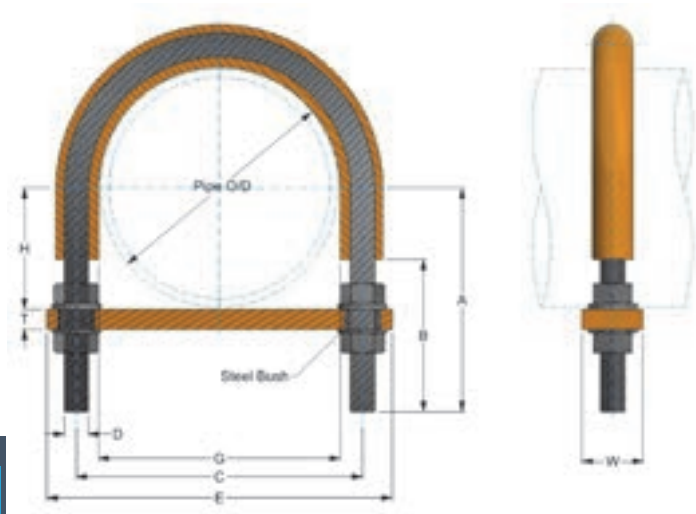


Fig. 113NG
Materials:
U-Bolt: Carbon Steel
Base Pad: HT/FR Silicone
Sleeve: Extruded HT/FR Silicone

4 x Full Nuts
2 x Steel Bushes
4 x Washers

Please Specify:-
- Figure Number:
- Part Number (CuNi):
- Nominal Pipe Size:

Isolation Equipment – Fig. 109, 110 & 118

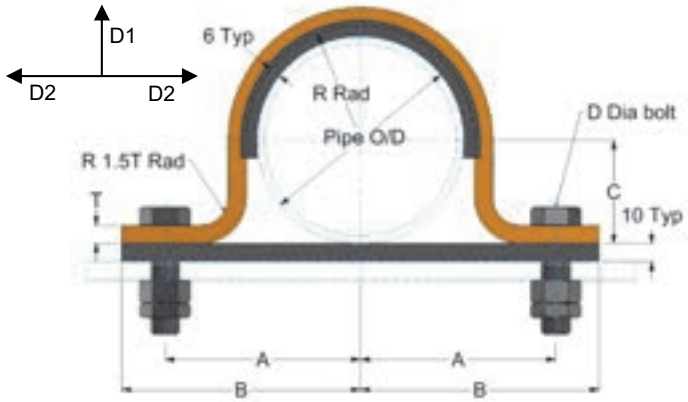


Fig. 109
Material: Carbon Steel
Clipstrip: HT/FR Silicone
Base Pad: HT/FR Silicone
Rubber Elastomer

2 x Full Nuts
2 x Locknuts

Please Specify:-
- Figure Number:
- NB (CS/SS Lines):
- O/D (CuNi Lines):
- Finish:

Fig. 109 – Isolation Pipe Saddle (C.S. / S.S. Pipe)

Pipe Size		WxT	A	B	C	D	R	Max Load Kg	
NB	O/D							D1	D2
15	21.3	35x5	53	68	10	M10	16.5	170	270
20	26.9	35x5	55	70	13	M10	19.5	170	210
25	33.7	35x5	57	72	16	M10	23	170	175
32	42.4	35x8	64	82	20	M12	27	315	285
40	48.3	35x8	79	97	23	M12	30	315	250
50	60.3	35x8	81	99	29	M12	36	315	200
65	76.1	50x10	89	113	36	M16	44	465	330
80	88.9	50x10	99	123	43	M16	50.5	465	280
100	114.3	50x10	108	132	55	M16	63	465	220
150	168.3	60x15	160	190	82	M20	90	990	410
200	219.1	60x15	185	215	107	M20	115.5	990	315
250	273.0	60x15	215	245	135	M20	142.5	2060	280
300	323.9	60x15	240	270	160	M20	168	2060	280

Fig. 109 – Isolation Pipe Saddle (CuNi Pipe)

Pipe O/D	WxT	A	B	C	D	R	Max Load Kg	
							D1	D2
16	35x5	53	68	8	M10	14	170	270
20	35x5	53	68	10	M10	16	170	270
25	35x5	55	70	12.5	M10	18.5	170	210
30	35x5	57	72	15	M10	21	170	210
38	35x8	64	82	19	M12	25	315	285
44.5	35x8	79	97	22	M12	28	315	285
57	35x8	81	99	28.5	M12	34.5	315	200
76.1	50x10	89	113	38	M16	44	465	330
88.9	50x10	99	123	44.5	M16	50.5	465	280
108	50x10	108	132	54	M16	60	465	220
133	60x15	136	166	66	M20	72.5	990	410
159	60x15	155	185	79.5	M20	85.5	990	410
193.7	60x15	175	205	97	M20	103	990	315
219.1	60x15	185	215	109.5	M20	115.5	990	315
267	60x15	215	245	133.5	M20	139.5	2060	280
323.9	60x15	240	270	162	M20	168	2060	280

Fig. 110A

Ref.	A	B	C	D	E
27x5	37	27	7.5	5	5
32x5	42	32	7.5	5	5
42x6	52	42	8.5	6	5
52x6	62	52	8.5	6	5
67x6	77	67	8.5	6	5
82x6	110	82	10	6	14
90x9.5	105	90	14.5	9.5	7.5
110x9.5	125	110	14.5	9.5	7.5
130x9.5	145	130	14.5	9.5	7.5

Fig. 110B

Ref.	A	B	C	D	E
35x2	45	35	6	2	5
45x2	55	45	6	2	5
55x2	65	55	6	2	5
65x2	75	65	6	2	5
75x2	85	75	6	2	5
85x2	95	85	6	2	5
95x2	105	95	6	2	5
105x2	115	105	6	2	5
115x2	125	115	6	2	5
135x2	145	135	6	2	5

Other sizes available on request

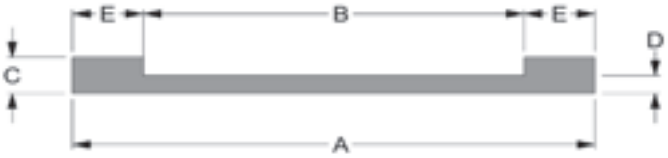


Fig. 110A & 110B
Material: HT/FR Silicone

Please Specify:-
- Figure Number:
- Ref.:
- Pipe O/D:

Fig.118A – For Stainless Steel Pipes

Part No.	Pipe Size		C	H x T
	NB	O/D		
21	15	21.3	60	25x10
27	20	26.9	70	
34	25	33.7	75	
43	32	42.4	95	
49	40	48.3	100	
61	50	60.3	110	
77	65	76.1	135	30x10
89	80	88.9	140	
115	100	114.3	170	
168	150	168.3	250	50x10
219	200	219.1	315	
273	250	273	375	
324	300	323.9	425	

Fig.118B – For CuNi Pipes

Part No.	Pipe Size	C	H x T
	O/D		
16	16	60	25x10
20	20	60	
25	25	70	
30	30	75	
38	38	95	
45	44.5	100	
57	57	110	30x10
76	76.1	135	
89	88.9	140	
108	108	170	50x10
159	159	250	
219	219	315	
267	267	375	
324	323.9	425	

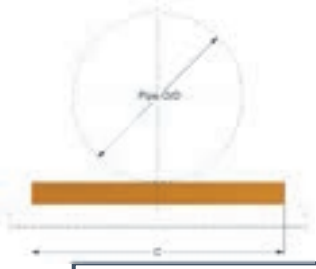
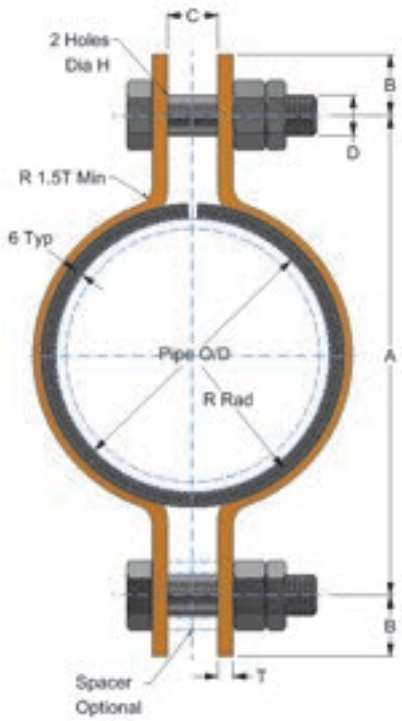


Fig. 118A & 118B
Material: Extruded 70/80 FR Neoprene (-30 to 100°C)

Please Specify:-
- Figure Number:
- Part Number:

Isolation Equipment – Fig. 107



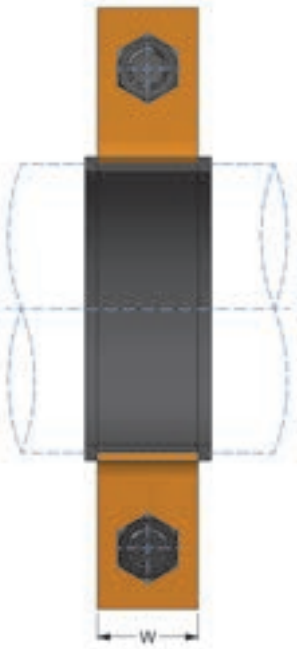


Fig. 107 – Isolation 2 Bolt Clamp (C.S. / S.S. Pipe)											
Pipe Size		A	B	C	D	H	*L	R	Spacer	WxT	Max Load Kg
NB	O/D										
15	21.3	100	15	10	M10	12	85	16.5	10NB	35x5	280
20	26.9	105	15	10	M10	12	91	19.5	10NB	35x5	280
25	33.7	110	15	10	M10	12	112	23	10NB	35x5	280
32	42.4	120	18	12	M12	15	139	27	15NB	35x5	280
40	48.3	125	18	12	M12	15	158	30	15NB	35x5	280
50	60.3	140	18	12	M12	15	196	36	15NB	35x5	280
65	76.1	155	18	12	M12	15	245	44	15NB	35x5	280
80	88.9	170	18	12	M12	15	286	50.5	15NB	35x5	280
100	114.3	195	18	12	M12	15	365	63	15NB	35x5	280
150	168.3	255	24	16	M16	19	535	90	20NB	35x8	450
200	219.1	325	24	16	M16	19	695	115.5	20NB	35x8	450
250	273	380	24	16	M16	19	875	142.5	20NB	35x8	450
300	323.9	450	30	20	M20	24	1030	168	20NB	50x10	900

Fig. 107/A
Material: Carbon Steel
Isolation: Silicone Rubber Elastomer

Please Specify:-
- Figure Number:
- NB (CS/SS Lines):
- O/D (CuNi Lines):
- Finish:

*L = Developed length of isolator

Fig. 107A – Isolation 2 Bolt Clamp (CuNi Pipe)										
Pipe O/D	A	B	C	D	H	*L	R	Spacer	WxT	Max Load kg
16	95	15	10	M10	12	67	14	10NB	35x5	280
20	95	15	10	M10	12	85	16	10NB	35x5	280
25	100	15	10	M10	12	91	18.5	10NB	35x5	280
30	105	15	10	M10	12	109	21	10NB	35x5	280
38	120	18	12	M12	15	134	25	15NB	35x5	280
44.5	120	18	12	M12	15	151	28	15NB	35x5	280
57	140	18	12	M12	15	190	34.5	15NB	35x5	280
76.1	155	18	12	M12	15	245	44	15NB	35x5	280
88.9	170	18	12	M12	15	286	50.5	15NB	35x5	280
108	190	18	12	M12	15	355	60	15NB	35x5	280
159	240	24	16	M16	19	515	86	20NB	35x8	450
219.1	325	24	16	M16	19	695	118	20NB	35x8	450
267	375	24	16	M16	19	855	140	20NB	35x8	450
323.9	450	30	20	M20	24	1030	168	20NB	50x10	900

Isolation Equipment – Fig. 108

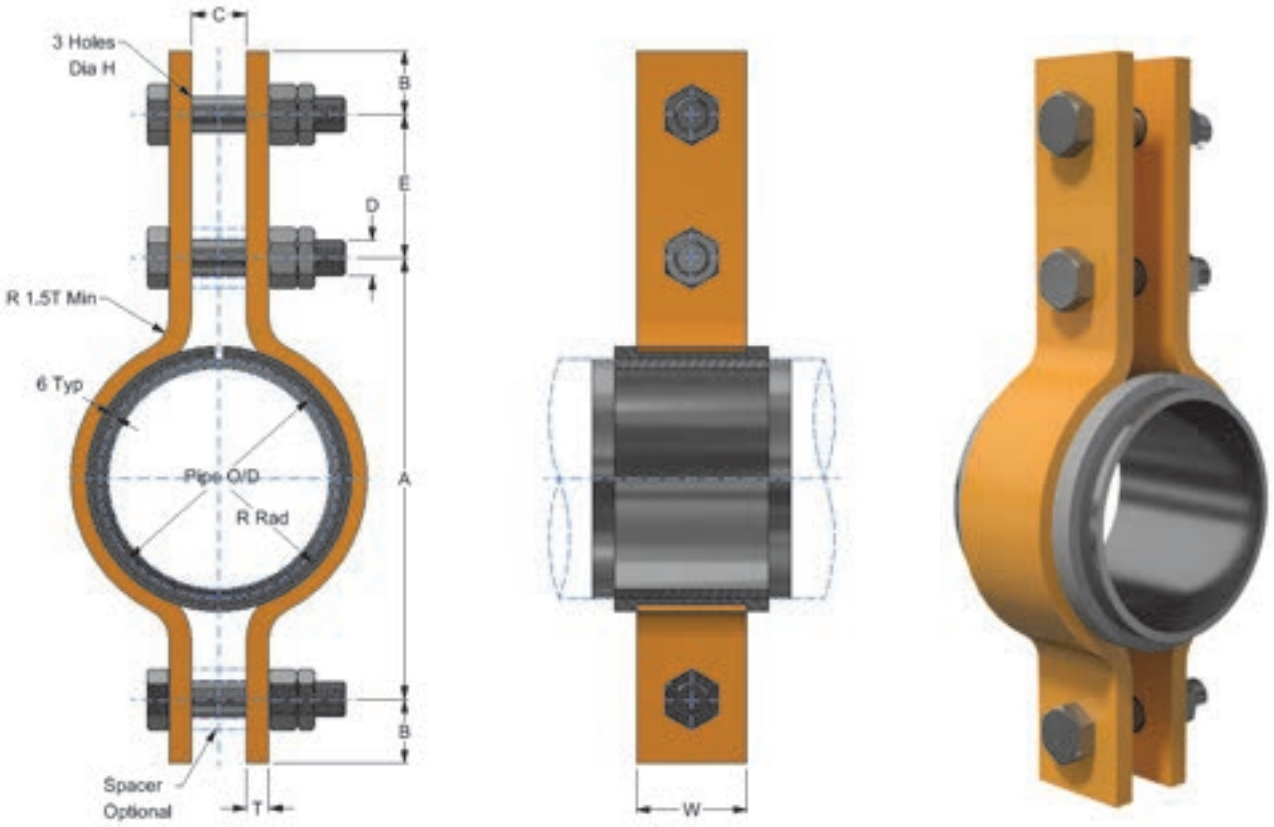


Fig. 108 – 3 Bolt Isolation Clamp (C.S. / S.S. Pipe)												
Pipe Size		A	B	C	D	E	H	*L	R	Spacer	WxT	Max Load Kg
NB	O/D											
15	21.3	100	15	13	M10	70	12	85	16.5	10NB	35x5	280
20	26.9	105	15	13	M10	70	12	91	19.5	10NB	35x5	280
25	33.7	110	15	13	M10	70	12	112	23	10NB	35x5	280
32	42.4	120	18	15	M12	70	15	139	27	15NB	35x5	280
40	48.3	125	18	15	M12	85	15	158	30	15NB	35x5	280
50	60.3	140	18	15	M12	80	15	196	36	15NB	35x5	280
65	76.1	155	18	15	M12	105	15	245	44	15NB	35x5	280
80	88.9	170	18	15	M12	105	15	286	50	15NB	35x5	280
100	114.3	195	18	15	M12	105	15	365	63	15NB	35x5	280
150	168.3	255	24	19	M16	95	19	535	90	20NB	35x8	450
200	219.1	325	24	19	M16	100	19	695	115.5	20NB	35x8	450
250	273	380	24	19	M16	105	19	875	142.5	20NB	50x10	450
300	323.9	450	30	23	M20	115	24	1030	168	20NB	60x15	900

Fig. 108/A
Material: Carbon Steel
Isolation: Silicone Rubber Elastomer

Please Specify:-

- Figure Number:
- NB (CS/SS Lines):
- O/D (CuNi Lines):
- Finish:

*L = Developed Length of Isolator

Fig. 108A – 3 Bolt Isolation Clamp (CuNi Pipe)											
Pipe O/D	A	B	C	D	E	H	*L	R	Spacer	WxT	Max Load kg
16	95	15	13	M10	70	12	67	14	10NB	35x5	280
20	95	15	13	M10	70	12	85	16	10NB	35x5	280
25	100	15	13	M10	70	12	91	18.5	10NB	35x5	280
30	105	15	13	M10	70	12	109	21	10NB	35x5	280
38	120	18	15	M12	70	15	134	25	15NB	35x5	280
44.5	120	18	15	M12	85	15	151	28	15NB	35x5	280
57	140	18	15	M12	80	15	190	34.5	15NB	35x5	280
76.1	155	18	15	M12	105	15	245	44	15NB	35x5	280
88.9	170	18	15	M12	105	15	286	50.5	15NB	35x5	280
108	190	18	15	M12	105	15	355	60	15NB	35x5	280
159	240	24	19	M16	95	19	515	85.5	20NB	35x8	450
219.1	325	24	19	M16	100	19	695	115.5	20NB	35x8	450
267	375	24	19	M16	105	19	855	140	20NB	50x10	450
323.9	450	30	23	M20	95	24	1030	168	20NB	60x15	900

Isolation Equipment – Fig. 115, 116 & 117

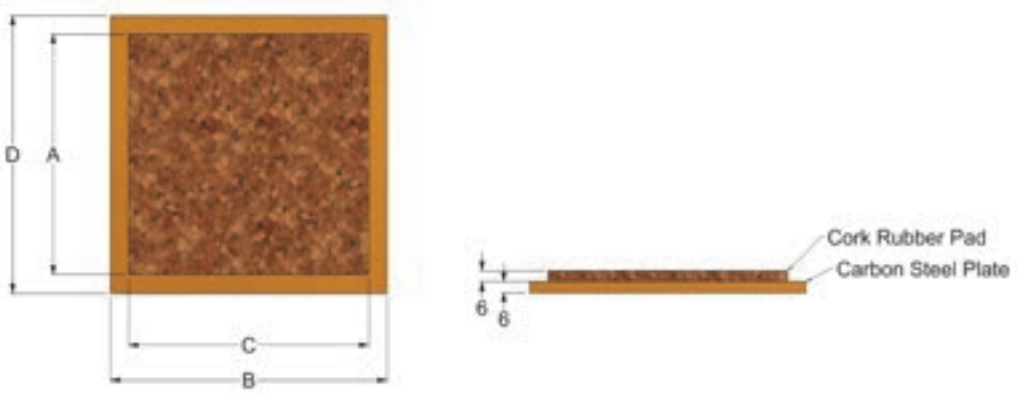


Fig. 115
Material: See Drawing

Please Specify:-
- Figure Number:
- Dimension A, B, C & D:

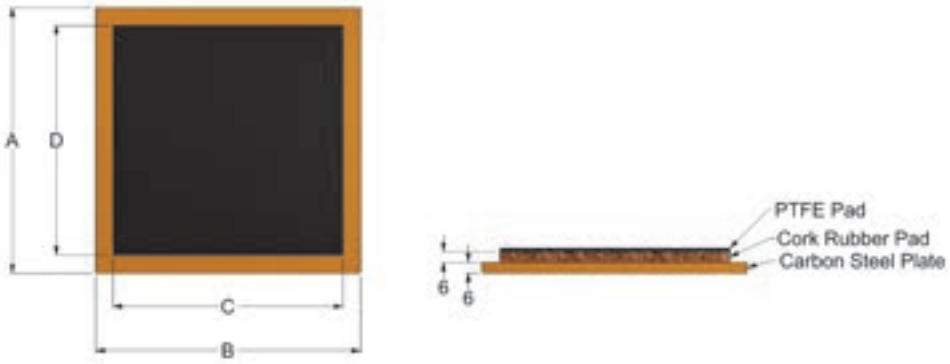


Fig. 116
Material: See Drawing

Please Specify:-
- Figure Number:
- Dimension A, B, C & D:

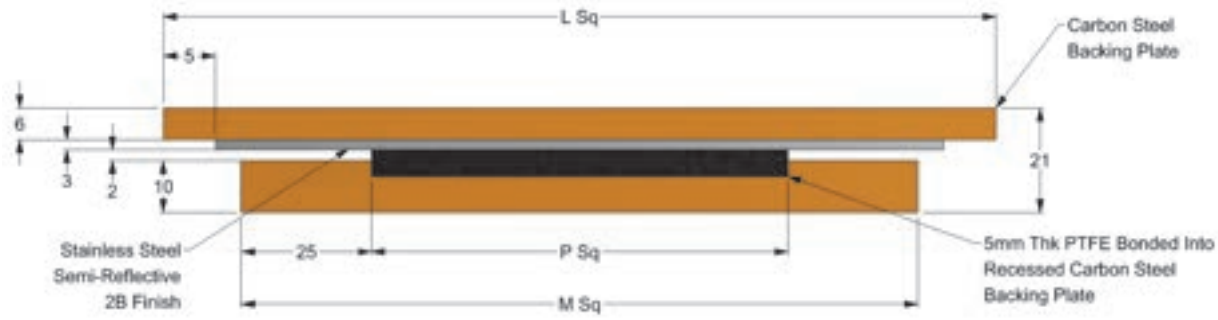


Fig.117 – Slider Unit						
Size	Recommended Loading (Kgf)	M	P	L Movement Range		
				A	B	C
1	100-500	70	20	60	90	120
2	400-2000	90	40	80	110	140
3	800-4500	110	60	100	130	160
4	1500-8000	130	80	120	150	180
5	2500-13000	150	100	140	170	200
6	4000-22000	180	130	170	200	230
7	7000-43000	230	180	220	250	280
8	12000-70000	280	230	270	300	330

Fig. 117
Material: See Drawing

Please Specify:-
- Figure Number:
- Dimension L, M & P:
- Movement Range:

Notes:
Adhesives available for bonding recessed PTFE will limit the maximum allowable temperature to 140°C.
Alternative mechanical bonding using countersunk screws will allow a maximum temperature of 200°C.

Range A allows ± 13mm movement
Range B allows ± 25mm movement
Range C allows ± 40mm movement

Top plate can be supplied square or rectangular to cater for coordinate direction movements.

Standard sliders are designed for site welding, alternative bolted attachments can be supplied.

It is recommended that sliding contact surfaces are installed parallel throughout the movement range.

PTFE Slide Bearings

General information
In a wide range of applications, PTFE slide bearings are superior to conventional expansion plates, rollers and rocker arm type supports. They support petrochemical plant, heavy machinery, pipelines, buildings and bridge girders; they accommodate expansion, contraction and other reciprocating motions of any structure that moves as a result of thermal, seismic or differential forces.

Bearings for such applications must operate at high loads and low speeds, and it is under just these conditions that the self-lubricating properties of PTFE are at maximum. This factor, together with its no stick-slip and anti-weathering characteristics, is the principle reason why PTFE has proved to be so successful as a slide bearing material.

Advantages
- The simplicity of the bearing design and its ease of fabrication and installation make the unit cost efficient.
- The costs of a construction can be reduced by designing for expansion rather than strain.
- Coefficient of friction over the bearing surface remains constant, even under worst case conditions.
- The bearings are maintenance free – PTFE is inherently self-lubricating, while dirt particles are absorbed into the material. Only simple maintenance is required against the significant ingress of dirt.

Design / Selection
QPS offers a specialist service, based on many years' experience in the use of PTFE and its application to slide bearings to assist in the design of bearing systems.

Low friction sliders with a coefficient of friction less than 0.1 are available. They are designed specifically for the loads and movements required. Most assemblies are also designed to be compatible with our range of standard shoes and saddles.

Stand-alone slide bearing sandwich plates Fig.117 as shown on page 156.

Bearing Assemblies
QPS slide bearings consist of a single PTFE pad counterfaced with a polished stainless steel plate. The assembly is designed to ensure that the PTFE pad is covered by the stainless steel plate throughout the expected design movements.

The basic element is a 5mm PTFE sheet, recessed into a 10mm steel backing plate for straight forward field installation by welding or bolting. The corresponding 3mm thick polished stainless steel plate is shop fitted to a 6mm thick carbon steel plate. Alternative thickness and materials for the backing plates can be supplied.

Where operating conditions require them, thermal insulation and vibration damping pads maybe bonded between the PTFE sheet and backing plate, or between the backing plate and the structure. To allow operation at high ambient temperature, a high temperature epoxy resin system is used for bonding, and the adhesives are cured under strictly controlled conditions, ensuring the bond is stronger than the PTFE itself.

As standard glass filled PTFE is used as the bearing material, the load bearing capacity is 140 Kg/cm^2.

Coefficients of Friction
The coefficient of friction of PTFE materials is dependent on many variables, including pressure, sliding velocity and temperature. Opinion is divided about the effect of some variables, although it is agreed that high pressure and low velocities favour low friction.

The coefficient is less than that of any other solid engineering material. It has been variously reported from 0.02 to 0.2, but this depends on surface preparation and the test method. The load friction chart (Fig. 1) shows the effect of the load.

In general the coefficient of friction between the mating surface and the PTFE slide bearing pad will be at a minimum when the stress in the PTFE is at maximum (consistent with acceptable limits of creep), the bearing is made from unfilled PTFE, and the finish of the mating surface is highly polished.

In addition, one of the most important frictional characteristics of the PTFE is the absence of 'stick-slip', because unlike all other conventional bearings, the static friction of PTFE is equal to or only marginally higher than the dynamic friction.

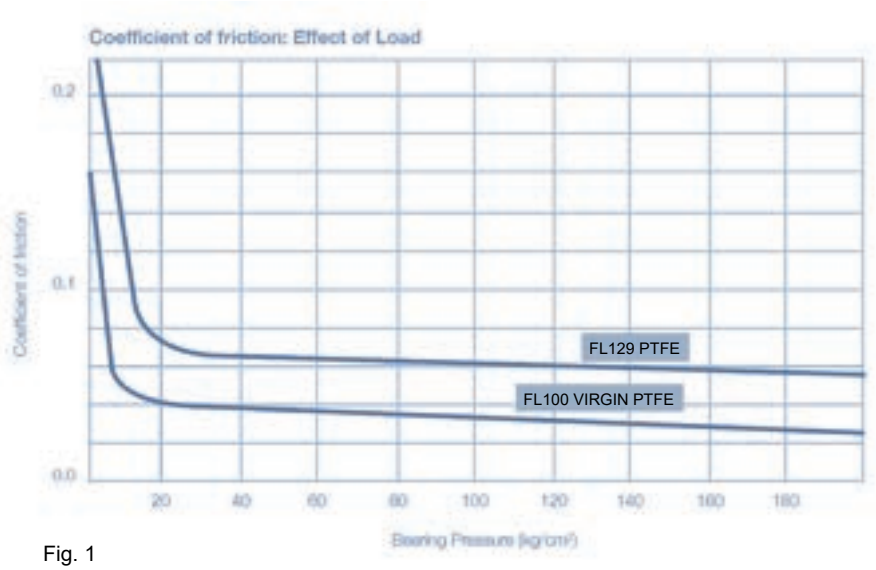


Fig. 1

PTFE Slide Bearings

Recommended Maximum Bearing Pressures
Fig. 2 indicates the optimum pressure, but depending on circumstances, design pressures may be allowed to vary from the optimum.

With the pressures, a design coefficient of friction 0.1 for unfilled PTFE or 0.12 for filled PTFE will give a significant margin of safety when operating conditions cannot accurately be predicted, but the figures obtained in practise will normally be considerably less than these.

Thermal Insulation
Where the temperature at the faces of the PTFE is likely to exceed 200°C by conduction through the bearing components, a thermal barrier must be interposed between the heat source and the sliding unit, QPS recommend using the use of Monolux 500 – the thickness required can be computed from the graph in Fig. 3. The graph shows the external surface temperature that can be anticipated using Monolux 500 in constructions up to 100mm thickness based on the practical tests. The actual surface temperature will differ with variations in surface conductance.

Bonding of PTFE
Chemical bonding is the recommended method for locating the bearing material on its support, because the shear value of the epoxy adhesive is greater than that of the PTFE. The temperature at the surface of the PTFE shall never exceed 140°C.

All bonded PTFE elements are not adversely affected by exposure to ultra violet light providing the minimum thickness requirement of 1.5mm is met.

Site bonding of PTFE is not recommended – strictly controlled conditions of cleanliness, pressure and temperature are required to obtain a satisfactory bond between PTFE and the substrate.

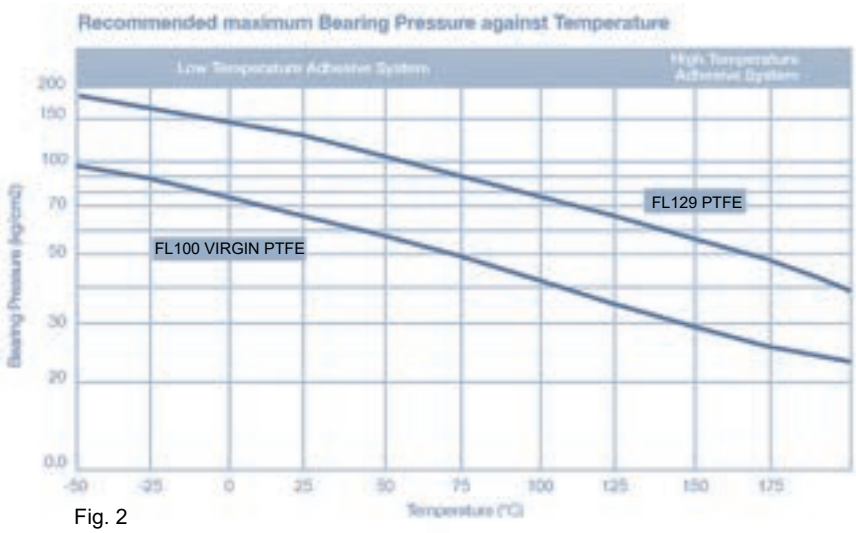


Fig. 2

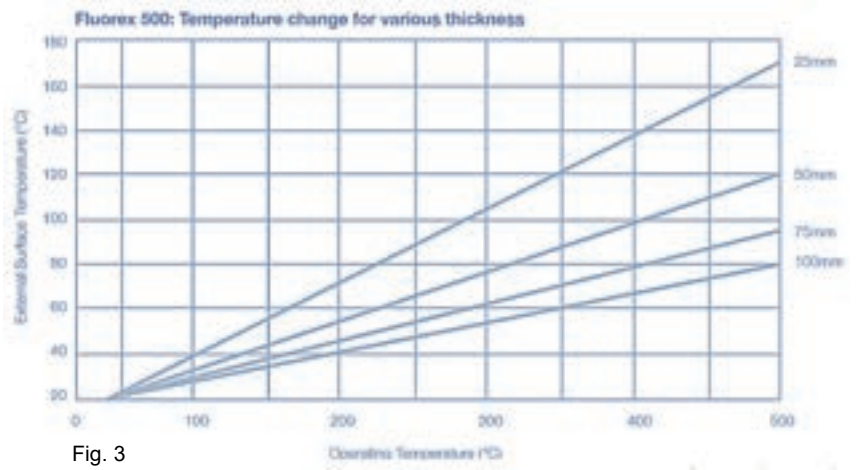


Fig. 3

Material Thickness
The ideal thickness has been found to be 5mm, due to the recessing requirement. This is thick enough to allow for some constructional misalignment and to allow for dirt and grit embedment.

Installation
The bearing components can be located to the installation by bolting, tack-welding, full welding or mortar embedment, and the appropriate type of bearing should be chosen according to the installation method. The PTFE should be adequately protected against weld splatter, paint spray, metal swarf, etc. during installation.

Pad Dimensions
The top bearing pad should be larger than the bottom pad by an amount equal to the expected movement, in order to maintain a constant contact area.

Bearing Temperature
The temperature at the surface of the PTFE should generally be less than 120°C and should never exceed 200°C. As a rule of thumb, under normal conditions the temperature falls by 200°C for every 100mm from the heat source (in ambient air) – for example, a typical horizontal vessel operating at 500°C will have a bottom of saddle temperature of about 150°C.

Temperature does not normally present a problem. However, if the bearing temperature is likely to exceed 200°C a thermal insulator should be fitted between the structure and the bearing back plate (see above topic – Thermal Insulation).

Vibration / Acoustic Dampening
Slide bearing units can be built with a variety of elastomer composite interlayers or backings to suit customers design parameters when acoustic or dampening is necessary. Elastomers may be used when simple angular or rotational movements are required.

PTFE Slide Bearings

Slideway Rigidity
When a series of slide bearings is used to form a slideway, e.g. for oil rig movement, the slide supports must be sufficiently rigid to avoid deflection of the individual bearings or uneven loading. Deflection of only a few degrees could significantly increase the apparent coefficient of friction, and cause bearing failure if all the load is carriedby one end of the bearing pad.

Design Steps
The following steps will provide an indication of the slide bearing requirements for a particular application:

- Determine the load of the structure – this will indicate the total load bearing area required at a suitable bearing pressure.
- Decide the number and position of the bearings according to the rigidity and function of the structure.
- Take account of operating temperature limits, and specify any necessary thermal insulation.
- Consider any unusual conditions affecting the bearings, such as the need for additional thermal insulation, damping pads, etc.
- Decide the most appropriate method of mounting the bearings.
- Select the types of bearings required and specify their dimensions.

Technical Advantages of PTFE Slide Bearings

- PTFE has the lowest coefficient of friction of any known solid engineering material including lubricated metal.
- There is no stick-slip action.
- They have indefinite life, since chemicals and weather have no effect on PTFE – moisture absorption is less than 0.01% even under icing conditions or immersion, and the material is chemically inert.
- No maintenance is required, PTFE will never cold weld to itself and therefore requires no lubrication.
- The bearings are easily installed, either pre-assembled or on site.
- PTFE bearings are far less bulky than alternative assemblies.
- There is no possibility of fatigue failure.
- Electrical and thermal insulation minimise galvanic corrosion and heat loss.
- Vibrations are damped.
- Small particles which may become embedded do not cause binding of the surfaces.
- The slide bearings can accommodate some misalignment in construction without setting up stress corrosion along a leading edge, as can occur in conventional bearings.