Contents

ISO 9001

Bridon operates quality management systems which comply with the requirements of EN ISO 9001:2000. These systems are assessed and registered by accredited certification bodies.

ISO 14001

Bridon operates environmental management systems which, where required by legislation or risk, comply with the requirements of EN ISO 14001:2004 and are assessed and registered by accredited certification bodies.

Suspension Bridges

Major suspension bridges with long spans

Locked Coil Strand

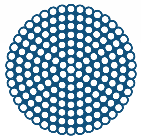
Core of helically spun round wires in several layers.
Cover of helically spun full lock wires in several layers.
Layers are spun in opposite directions.
Internal blocking compound and lubricant applied during stranding.

- Very high axial stiffness
- High breaking load due to 'z' shaped wires
- Excellent clamping capabilities due to 'z' shaped wires
- Even surface due to 'z' shaped wires
- Torque balanced due to cross laying
- High fatigue resistance
- Excellent corrosion resistance due to
  - Galvanised wires (zinc or Galfan®)
  - Internal blocking compound
  - Locked surface due to 'z' shaped wires
  - Additional coatings (if required)
- Standards
  - EN12385-10
  - German TL Seile
  - Norwegian Handbook 122
- Diameter range 20 - 180 mm
- Properties range
  - 367 - 31400 kN Minimum Breaking Load
  - 42 - 3780 MN Nominal Axial Stiffness

See page 10

- **Catenary cables**
- **Hanger cables**

Spiral Strand



Helically spun round wires in several layers.
Layers are spun in opposite directions.
Internal blocking compound and lubricant can be applied during stranding.

- High axial stiffness
- High breaking load due to high strength wires
- Good clamping capabilities
- Torque balanced due to cross laying
- High fatigue resistance
- Excellent corrosion resistance due to
  - Galvanised wires (zinc or Galfan®)
  - Internal blocking compound
  - Additional coating (if required)
- Standards
  - EN12385-10
  - ASTM A586
- Diameter range 13 - 165mm
- Properties range
  - 171 - 25200 kN Minimum Breaking Load
  - 19 - 2640 MN Nominal Axial Stiffness

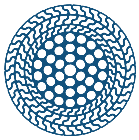
See page 11

- **Catenary cables**
- **Hanger cables**
- **Handstrand cables**
- **Catwalk Cable**

Cable Stayed Bridges

Major cable stayed bridges with long spans

Locked Coil Strand



Core of helically spun round wires in several layers.
Cover of helically spun full lock wires in several layers.
Layers are spun in opposite directions.
Internal blocking compound and lubricant applied during stranding.

- Very high axial stiffness
- High breaking load due to 'z' shaped wires
- Excellent clamping capabilities due to 'z' shaped wires
- Even surface due to 'z' shaped wires
- Torque balanced due to cross laying
- High fatigue resistance
- Excellent corrosion resistance due to
  - Galvanised wires (zinc or Galfan®)
  - Internal blocking compound
  - Locked surface due to 'z' shaped wires
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- Standards
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- Diameter range 20 - 180 mm
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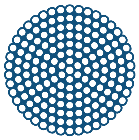
See page 10

● **Stay cables**

Spiral Strand



Helically spun round wires in several layers.
Layers are spun in opposite directions.
Internal blocking compound and lubricant can be applied during stranding.

- High axial stiffness
- High breaking load due to high strength wires
- Good clamping capabilities
- Torque balanced due to cross laying
- High fatigue resistance
- Excellent corrosion resistance due to
  - Galvanised wires (zinc or Galfan®)
  - Internal blocking compound
  - Additional coating (if required)
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  - ASTM A586
- Diameter range 13 - 165mm
- Properties range
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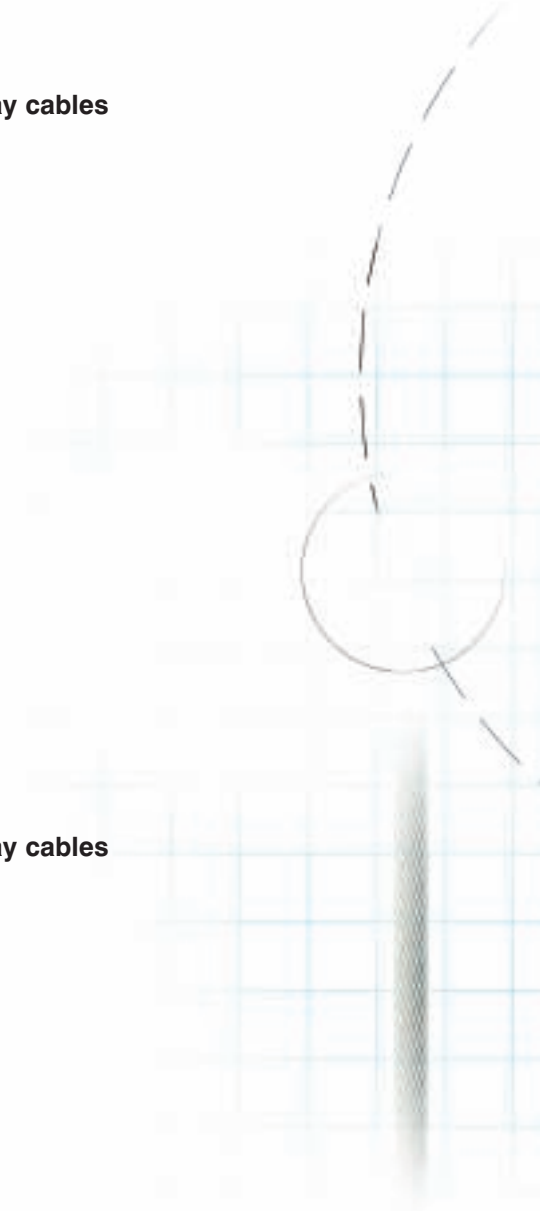
See page 11

● **Stay cables**



Tied Arch Bridges

Major tied arch bridges with long spans

Locked Coil Strand

Core of helically spun round wires in several layers.
Cover of helically spun full lock wires in several layers.
Layers are spun in opposite directions.
Internal blocking compound and lubricant applied during stranding.

- Very high axial stiffness
- High breaking load due to 'z' shaped wires
- Excellent clamping capabilities due to 'z' shaped wires
- Even surface due to 'z' shaped wires
- Torque balanced due to cross laying
- High fatigue resistance
- Excellent corrosion resistance due to
  - Galvanised wires (zinc or Galfan®)
  - Internal blocking compound
  - Locked surface due to 'z' shaped wires
  - Additional coatings (if required)
- Standards
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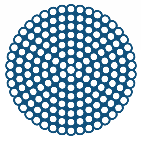
  - German TL Seile
  - Norwegian Handbook 122
- Diameter range 20 - 180 mm
- Properties range
  - 367 - 31400 kN Minimum Breaking Load
  - 42 - 3780 MN Nominal Axial Stiffness

See page 10

● **Cable Ties**

Spiral Strand



Helically spun round wires in several layers.
Layers are spun in opposite directions.
Internal blocking compound and lubricant can be applied during stranding.

- High axial stiffness
- High breaking load due to high strength wires
- Good clamping capabilities
- Torque balanced due to cross laying
- High fatigue resistance
- Excellent corrosion resistance due to
  - Galvanised wires (zinc or Galfan®)
  - Internal blocking compound
  - Additional coating (if required)
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  - ASTM A586
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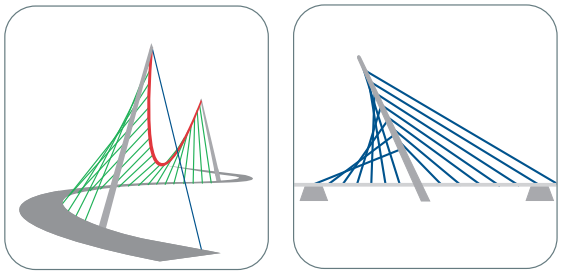
See page 11

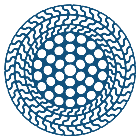
● **Cable Ties**

Architectural Footbridges

All types of small bridges including small suspension, cable stayed and arch bridges.



Locked Coil Strand



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Layers are spun in opposite directions.
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- Excellent clamping capabilities due to 'z' shaped wires
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- Torque balanced due to cross laying
- High fatigue resistance
- Excellent corrosion resistance due to
  - Galvanised wires (zinc or Galfan®)
  - Internal blocking compound
  - Locked surface due to 'z' shaped wires
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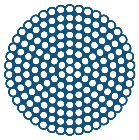
See page 10

- **Catenary cables**
- **Hanger cables**
- **Stay cables**

Spiral Strand



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  - Additional coating (if required)
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  - ASTM A586
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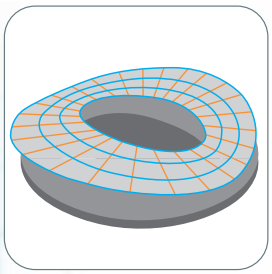
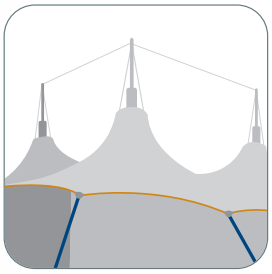
See page 11

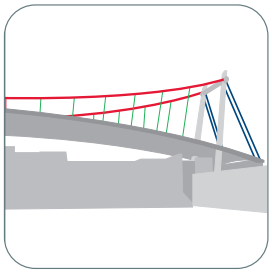
- **Catenary cables**
- **Hanger cables**
- **Stay cables**

Roof Structures

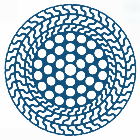
Wide span, light weight roofs







Locked Coil Strand



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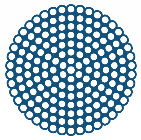
See page 10

- **Catenary cables**
- **Hanger cables**
- **Stay cables**
- **Ring cables**
- **Radial cables**
- **Edge cables**

Spiral Strand



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See page 11

- **Catenary cables**
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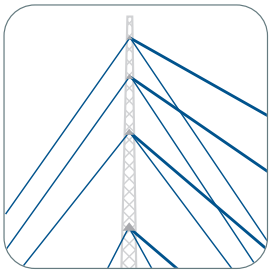
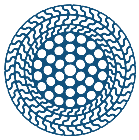
- **Stay cables**
- **Ring cables**
- **Radial cables**
- **Edge cables**

Stayed Masts and Towers

Tall, slender masts and towers supported by cables



Locked Coil Strand



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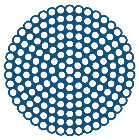
See page 10

● **Stay cables**

Spiral Strand



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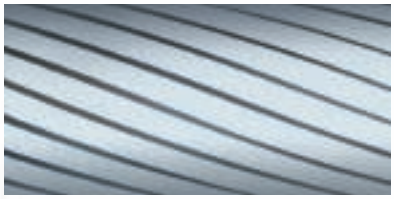
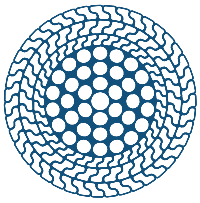
See page 11

● **Stay cables**



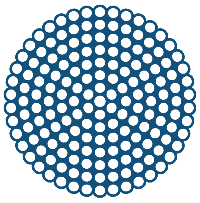


Locked Coil Strand (LC)

Product Code / Strand Diameter	Minimum Breaking Load	Design Load $G_{R,d}$ = MBL / 1,5 / 1,1	Nominal Metallic Cross Section	Nominal Axial Stiffness	Nominal Metallic Mass
d	MBL	$G_{R,d}$	A	EA	Mass
mm	kN	kN	mm²	MN	kg/m
LC 20	368	223	254	42	2.04
LC 25	574	348	398	66	3.20
LC 30	858	520	594	98	4.77
LC 35	1170	709	808	133	6.49
LC 40	1580	958	1090	180	8.76
LC 45	2000	1212	1390	229	11.1
LC 50	2470	1497	1710	282	13.7
LC 55	3020	1830	2090	345	16.8
LC 60	3590	2176	2490	411	20.0
LC 65	4220	2558	2920	482	23.5
LC 70	4890	2964	3390	559	27.2
LC 75	5620	3406	3890	642	31.3
LC 80	6390	3873	4420	729	35.5
LC 85	7220	4376	5000	824	40.1
LC 90	8090	4903	5600	924	45.0
LC 95	9120	5527	6310	1040	50.7
LC 100	10100	6121	6990	1150	56.2
LC 105	11100	6727	7710	1270	61.9
LC 110	12200	7394	8460	1400	68.0
LC 115	13300	8061	9280	1530	74.5
LC 120	14500	8788	10100	1670	81.1
LC 125	15700	9515	11000	1820	88.4
LC 130	16200	9818	11900	1960	95.6
LC 135	17500	10606	12920	2130	104
LC 140	18700	11333	13900	2290	112
LC 145	20100	12182	14910	2460	120
LC 150	21500	13030	15900	2620	128
LC 155	23000	13939	16990	2800	136
LC 160	24500	14848	18100	2990	145
LC 165	26100	15818	19250	3180	155
LC 170	27600	16727	20400	3370	164
LC 175	29300	17758	21650	3570	174
LC 180	31000	18788	22900	3780	184

Figures shown are for guidance purposes only. For details specific to your requirement please contact Bridon.

- Alternative sizes and constructions are availible to suit individual applications.
- Minimising the number of different strand diameters can optimise costs.
- All Stylite® sockets are suitable for use with Locked Coil Strand. ***See pages 12 - 23***
- Swaged sockets are not suitable for use with Locked Coil Strand.
- Strands with internal blocking material add 3% to nominal metallic mass.

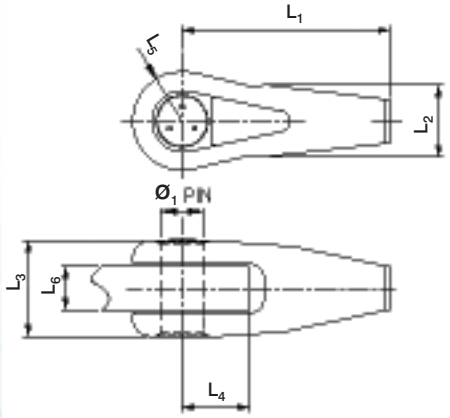


Spiral Strand (SS)

Product Code / Strand Diameter	Minimum Breaking Load	Design Load $G_{R,d}$ = MBL / 1,5 / 1,1	Nominal Metallic Cross Section	Nominal Axial Stiffness	Nominal Metallic Mass
d	MBL	$G_{R,d}$	A	EA	Mass
mm	kN	kN	mm²	MN	kg/m
SS 13	171	104	105	19	0.85
SS 16	254	154	156	27	1.26
SS 19	356	216	219	38	1.77
SS 22	455	276	279	49	2.26
SS 25	610	370	377	66	3.05
SS 30	864	524	541	95	4.29
SS 35	1190	719	731	124	5.91
SS 40	1540	931	973	160	7.63
SS 45	1960	1190	1200	204	9.73
SS 50	2400	1460	1470	242	11.9
SS 55	2920	1770	1790	295	14.6
SS 60	3460	2100	2120	350	17.2
SS 65	4070	2470	2500	413	20.4
SS 70	4700	2850	2890	462	23.6
SS 75	5420	3290	3330	533	27.3
SS 80	5910	3580	3670	569	30.8
SS 85	6680	4050	4150	643	34.8
SS 90	7320	4440	4650	721	39.0
SS 95	8160	4950	5190	804	43.5
SS 100	9040	5480	5740	890	48.2
SS 105	10200	6160	6340	983	53.1
SS 110	11200	6760	6950	1080	58.3
SS 115	12300	7440	7610	1180	63.7
SS 120	13300	8060	8280	1280	69.4
SS 125	14500	8760	8980	1390	75.3
SS 130	15600	9470	9710	1510	81.4
SS 135	16800	10200	10500	1630	87.8
SS 140	18200	11000	11300	1750	94.4
SS 145	19500	11800	12100	1880	102
SS 150	20800	12600	13000	2020	108
SS 155	22200	13500	13800	2140	113
SS 160	23700	14300	14800	2300	121
SS 165	25200	15300	15700	2440	128

Figures shown are for guidance purposes only. For details specific to your requirement please contact Bridon.

- Alternative sizes and constructions are availible to suit individual applications.
- Minimising the number of different strand diameters can optimise costs.
- Swaged sockets are suitable for Spiral Strand diameters up to 35mm. ***See pages 24 - 29***
- Stylite® sockets are suitable for use with all Spiral Strand diameters. ***See pages 12 - 23***
- Strands with internal blocking material add 4% to nominal metallic mass



Stylite Fork Sockets (ST-F)

Product Code / Strand Diameter	L_1	L_2	L_3	L_4	L_5	L_6		$Ø_1$		Weight	
						Max	Min	Pin	Pin Hole	Socket	Pin+ Caps
mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	kg	kg
ST-F 25	275	88	121	73	58	57	55	45	46	8	1.7
ST-F 30	330	105	154	86	70	71	68	55	56	15.5	2.9
ST-F 35	385	120	175	100	82.5	85	79	65	66	22.5	4.7
ST-F 40	410	130	187	120	95	90	82	75	76	31.5	6.6
ST-F 45	420	145	210	124	100	95	90	80	81	43	8.4
ST-F 50	440	155	221	144	115	100	93	90	91	56	11
ST-F 55	477	168	233	155	115	110	100	100	101	60	14
ST-F 60	520	180	250	168	125	120	110	110	111	74	18
ST-F 65	565	195	267	187	137	129	115	120	121	94	24
ST-F 70	610	210	285	202	148	137	125	130	131	117	30
ST-F 75	645	225	307	211	154	147	135	135	136	141	34
ST-F 80	690	240	322	226	166	157	145	145	146	167	42
ST-F 85	735	255	348	240	177	167	155	155	156	209	51
ST-F 90	780	270	366	255	188	178	165	165	166	245	61
ST-F 95	825	285	383	274	200	186	175	175	176	291	72
ST-F 100	870	300	421	294	211	197	185	185	186	352	87
ST-F 105	905	315	438	298	218	206	195	190	191	394	96
ST-F 110	950	330	458	318	228	215	205	200	201	457	112
ST-F 115	995	345	474	332	240	225	215	210	211	517	128
ST-F 120	1035	365	482	347	255	235	225	220	221	578	144
ST-F 125	1080	375	501	361	266	245	230	230	231	649	164
ST-F 130	1140	385	524	396	273	257	240	235	237	740	178
ST-F 135	1185	400	539	410	279	267	250	240	242	825	192
ST-F 140	1230	415	557	430	290	277	260	250	252	920	215
ST-F 145	1276	425	575	445	306	287	270	260	262	1009	239
ST-F 150	1321	440	587	465	315	297	280	270	272	1099	265

Figures shown are for guidance purposes only. For details specific to your requirement please contact Bridon.

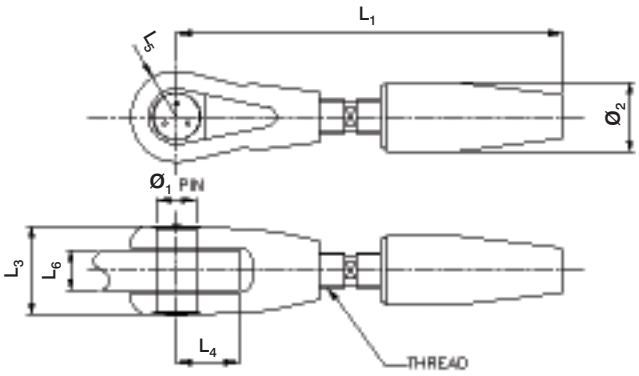
- Suitable for Locked Coil Strand and Spiral Strand
- Architectural socket design
- 100% efficiency, transmits the whole strand force

Steelwork dimensions for guidance purposes:

L_4 maximum swing of connecting linkage

L_6 width of connecting steelwork including protective coating e.g. paint, galvanising, etc.

For strand diameters larger than 150mm contact Bridon.



Stylite Adjustable Fork Sockets (ST-AF)

Product Code / Strand Diameter	L_1		ADJT +/-	L_3	L_4	L_5	L_6		$Ø_1$		$Ø_2$	Thread Size	Weight
	Max	Min					Max	Min	Pin	Pin Hole			Assy
mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	Metric	kg
ST-AF 25	631	531	50	121	73	58	57	55	45	46	87	M42 x 4.5	20
ST-AF 30	701	601	50	154	86	70	71	68	55	56	108	M52 x 5.0	36
ST-AF 35	815	695	60	175	100	82.5	85	79	65	66	120	M60 x 5.5	49
ST-AF 40	865	745	60	187	120	95	90	82	75	76	135	M68 x 6.0	69
ST-AF 45	894	774	60	210	124	100	95	90	80	81	145	M76 x 6.0	87
ST-AF 50	974	834	70	221	144	115	100	93	90	91	155	M80 x 6.0	112
ST-AF 55	1030	890	70	233	155	115	110	100	100	101	170	M90 x 6.0	131
ST-AF 60	1088	948	70	250	168	125	120	110	110	111	185	M95 x 6.0	163
ST-AF 65	1161	1021	70	267	187	137	129	115	120	121	205	M105 x 6.0	210
ST-AF 70	1247	1087	80	285	202	148	137	125	130	131	220	M105 x 6.0	260
ST-AF 75	1316	1156	80	307	211	154	147	135	135	136	235	M115 x 6.0	309
ST-AF 80	1416	1236	90	322	226	166	157	145	145	146	245	M120 x 6.0	365
ST-AF 85	1480	1300	90	348	240	177	167	155	155	156	265	M125 x 6.0	447
ST-AF 90	1590	1390	100	366	255	188	178	165	165	166	270	M135 x 6.0	514
ST-AF 95	1644	1444	100	383	274	200	186	175	175	176	285	M140 x 6.0	591
ST-AF 100	1764	1544	110	421	294	211	197	185	185	186	300	M150 x 6.0	700
ST-AF 105	1853	1613	120	438	298	218	206	195	190	191	315	M155 x 6.0	816
ST-AF 110	1983	1723	130	458	318	228	215	205	200	201	330	M165 x 6.0	942
ST-AF 115	2077	1797	140	474	332	240	225	215	210	211	345	M175 x 6.0	1084
ST-AF 120	2152	1872	140	482	347	255	235	225	220	221	360	M185 x 6.0	1224
ST-AF 125	2246	1946	150	501	361	266	245	230	230	231	375	M190 x 6.0	1364
ST-AF 130	2321	2021	150	524	396	273	257	240	235	237	390	M195 x 6.0	1513
ST-AF 135	2417	2097	160	539	410	279	267	250	240	242	400	M200 x 6.0	1741
ST-AF 140	2485	2165	160	557	430	290	277	260	250	252	415	M205 x 6.0	1929
ST-AF 145	2610	2260	175	575	445	306	287	270	260	262	430	M215 x 6.0	2147
ST-AF 150	2670	2320	175	587	465	315	297	280	270	272	445	M220 x 6.0	2340

Figures shown are for guidance purposes only. For details specific to your requirement please contact Bridon.

- Suitable for Locked Coil Strand and Spiral Strand
- Architectural socket design
- 100% efficiency, transmits the whole strand force

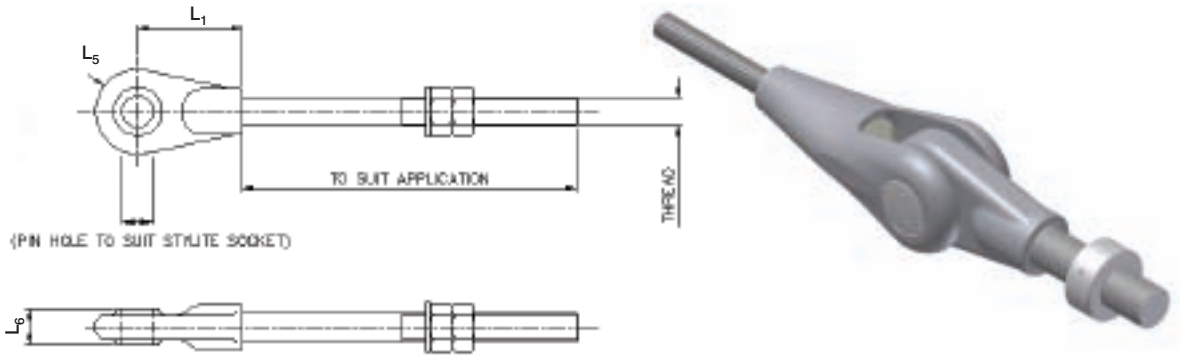
Steelwork dimensions for guidance purposes:

L_4 maximum swing of connecting linkage

L_6 width of connecting steelwork including protective coating e.g. paint, galvanising, etc.

For strand diameters larger than 150mm contact Bridon.

STYLITE



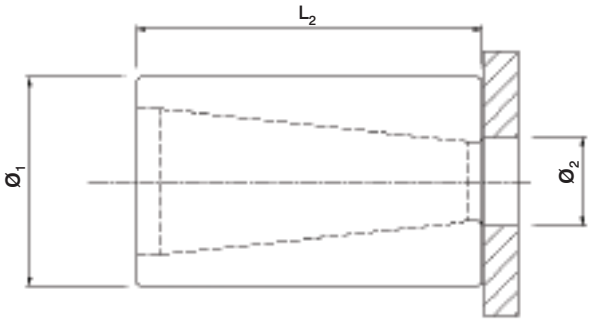
Stylite Fork Socket Adapter Bar (ST-FA)

Product Code / Strand Diameter	L_1	L_5	L_6	Thread Size	Weight (Not Including Bar)
mm	mm	mm	mm	Metric	kg
ST-FA 25	155	58	56	M42 x 4.5	5
ST-FA 30	190	70	70	M52 x 5.0	9
ST-FA 35	210	82	80	M60 x 5.5	13
ST-FA 40	240	95	85	M68 x 6.0	18
ST-FA 45	260	100	90	M72 x 6.0	25
ST-FA 50	285	115	95	M80 x 6.0	32
ST-FA 55	300	115	107	M90 X 6.0	44
ST-FA 60	325	125	115	M95 X 6.0	54
ST-FA 65	355	137	120	M105 x 6.0	68
ST-FA 70	365	148	130	M105 x 6.0	80
ST-FA 75	395	154	140	M115 x 6.0	98
ST-FA 80	415	166	150	M120 x 6.0	117
ST-FA 85	440	177	160	M125 x 6.0	136
ST-FA 90	470	188	170	M135 x 6.0	165
ST-FA 95	495	200	180	M140 x 6.0	195
ST-FA 100	525	211	190	M150 x 6.0	237
ST-FA 105	541	218	200	M155 x 6.0	261
ST-FA 110	570	228	210	M165 x 6.0	299
ST-FA 115	600	240	220	M175 x 6.0	348
ST-FA 120	635	255	230	M185 x 6.0	411
ST-FA 125	660	266	240	M190 x 6.0	463
ST-FA 130	680	273	250	M195 x 6.0	492
ST-FA 135	700	279	260	M200 x 6.0	532
ST-FA 140	720	290	270	M205 x 6.0	589
ST-FA 145	750	303	280	M215 x 6.0	652
ST-FA 150	775	315	290	M220 X 6.0	726

Figures shown are for guidance purposes only. For details specific to your requirement please contact Bridon.

- Suitable for Locked Coil Strand and Spiral Strand
- Architectural socket design
- 100% efficiency, transmits the whole strand force

For strand diameters larger than 150mm contact Bridon.



Stylite Plain Cylindrical Socket (ST-PC)

Product Code / Strand Diameter	L_2	$Ø_1$	$Ø_2$	Weight
mm	mm	mm	mm	kg
ST-PC 25	185	87	44	5
ST-PC 30	220	108	46	11
ST-PC 35	255	120	51	15
ST-PC 40	260	135	57	20
ST-PC 45	265	145	63	23
ST-PC 30	265	155	69	26
ST-PC 55	290	170	77	35
ST-PC 60	315	185	82	45
ST-PC 65	340	205	88	61
ST-PC 70	365	220	96	75
ST-PC 75	390	235	102	91
ST-PC 80	415	245	107	104
ST-PC 85	440	265	113	132
STPC 90	465	270	119	139
ST-PC 95	495	285	124	166
ST-PC 100	520	300	132	193
ST-PC 105	545	315	138	223
ST-PC 110	570	330	144	255
ST-PC 115	595	345	149	293
ST-PC 120	620	360	155	332
ST-PC 125	645	375	161	360
ST-PC 130	670	390	167	421
ST-PC 135	695	400	173	454
ST-PC 140	720	415	178	508
ST-PC 145	750	430	184	567
ST-PC 150	775	445	190	627

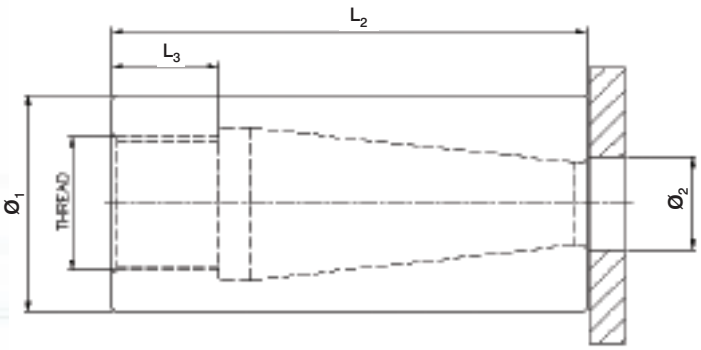
Figures shown are for guidance purposes only. For details specific to your requirement please contact Bridon.

- Suitable for Locked Coil Strand and Spiral Strand
- Architectural socket design
- 100% efficiency, transmits the whole strand force

Steelwork dimensions for guidance purposes:

$Ø_2$ - Recommended hole size in supporting steelwork / split plate or "c" washer slot width

For strand diameters larger than 150mm contact Bridon.



Stylite Internal Thread Cylindrical Socket (ST-IC)

Product Code / Strand Diameter	L_2	L_3	$Ø_1$	$Ø_2$	Thread Size	Weight
mm	mm	mm	mm	mm	Metric	kg
ST-IC 25	250	55	87	44	M56 x 5.5	8
ST-IC 30	290	60	108	46	M72 x 6.0	14
ST-IC 35	330	65	120	51	M80 x 6.0	19
ST-IC 40	345	75	135	57	M90 x 6.0	25
ST-IC 45	350	80	145	63	M95 x 6.0	30
ST-IC 50	360	90	155	69	M100 x 6.0	35
ST-IC 55	390	95	170	77	M110 x 6.0	46
ST-IC 60	420	100	185	82	M120 x 6.0	59
ST-IC 65	450	105	205	88	M135 x 6.0	78
ST-IC 70	480	110	220	96	M145 x 6.0	95
ST-IC 75	515	115	235	102	M155 x 6.0	117
ST-IC 80	545	120	245	107	M165 x 6.0	132
ST-IC 85	575	125	265	113	M175 x 6.0	166
ST-IC 90	610	135	270	119	M180 x 6.0	177
ST-IC 95	640	140	285	124	M190 x 6.0	208
ST-IC 100	675	150	300	132	M200 x 6.0	242
ST-IC 105	710	155	315	138	M210 x 6.0	281
ST-IC 110	740	160	330	144	M220 x 6.0	321
ST-IC 115	770	165	345	149	M230 x 6.0	367
ST-IC 120	800	170	360	155	M240 x 6.0	414
ST-IC 125	835	180	375	161	M245 x 6.0	453
ST-IC 130	860	180	390	167	M260 x 6.0	523
ST-IC 135	890	185	400	173	M265 x 6.0	564
ST-IC 140	920	190	415	178	M275 x 6.0	630
ST-IC 145	950	195	430	184	M285 x 6.0	698
ST-IC 150	980	200	445	190	M295 x 6.0	771

Figures shown are for guidance purposes only. For details specific to your requirement please contact Bridon.

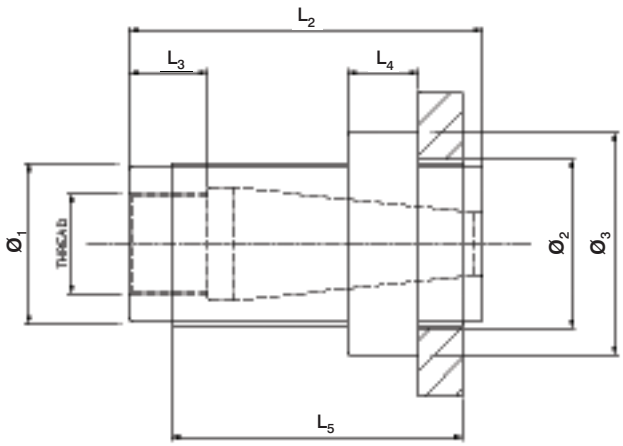
- Suitable for Locked Coil Strand and Spiral Strand
- Architectural socket design
- 100% efficiency, transmits the whole strand force

Steelwork dimensions for guidance purposes:

$Ø_2$ - Recommended hole size in supporting steelwork / split plate or "c" washer slot width

For strand diameters larger than 150mm contact Bridon.

STYLITE



Stylite Internal/External Thread Cylindrical Socket (ST-IEC)

Product Code / Strand Diameter	L_2	L_3	L_4	L_5	$Ø_1$	$Ø_2$	$Ø_3$	Thread Size	Weight	
									Socket	Nut
mm	mm	mm	mm	mm	mm	mm	mm	Metric	kg	kg
ST-IEC 25	250	55	40	200	100	110	140	M56 x 5.5	10	2
ST-IEC 30	290	60	45	235	106	115	155	M72 x 6.0	11	3
ST-IEC 35	330	65	50	275	125	135	175	M80 x 6.0	19	4
ST-IEC 40	345	75	60	290	132	142	190	M90 x 6.0	21	7
ST-IEC 45	350	80	66	295	150	160	210	M95 x 6.0	30	9
ST-IEC 50	360	90	72	305	160	170	225	M100 x 6.0	35	11
ST-IEC 55	390	95	78	335	180	190	250	M110 x 6.0	50	14
ST-IEC 60	420	100	84	365	190	200	265	M120 x 6.0	59	18
ST-IEC 65	450	105	88	390	212	222	290	M135 x 6.0	79	22
ST-IEC 70	480	110	96	420	224	234	310	M145 x 6.0	94	28
ST-IEC 75	515	115	104	455	236	246	325	M155 x 6.0	110	33
ST-IEC 80	545	120	112	485	250	260	345	M165 x 6.0	131	40
ST-IEC 85	575	125	120	505	265	275	365	M175 x 6.0	153	48
ST-IEC 90	610	135	130	540	280	290	385	M180 x 6.0	184	58
ST-IEC 95	640	140	130	570	300	310	410	M190 x 6.0	227	64
ST-IEC 100	675	150	140	605	315	325	430	M200 x 6.0	264	76
ST-IEC 105	710	155	144	630	335	345	455	M210 x 6.0	315	87
ST-IEC 110	740	160	156	660	355	365	480	M220 x 6.0	374	104
ST-IEC 115	770	165	168	690	355	365	490	M230 x 6.0	374	122
ST-IEC 120	800	170	168	720	375	385	520	M240 x 6.0	441	138
ST-IEC 125	835	180	176	740	400	415	550	M245 x 6.0	530	161
ST-IEC 130	860	180	176	765	400	415	560	M260 x 6.0	521	173
ST-IEC 135	890	185	176	795	425	440	585	M265 x 6.0	631	182
ST-IEC 140	920	190	192	825	425	440	595	M275 x 6.0	630	212
ST-IEC 145	950	195	192	855	450	465	620	M285 x 6.0	750	223
ST-IEC 150	980	200	192	885	450	465	630	M295 x 6.0	745	237

Figures shown are for guidance purposes only. For details specific to your requirement please contact Bridon.

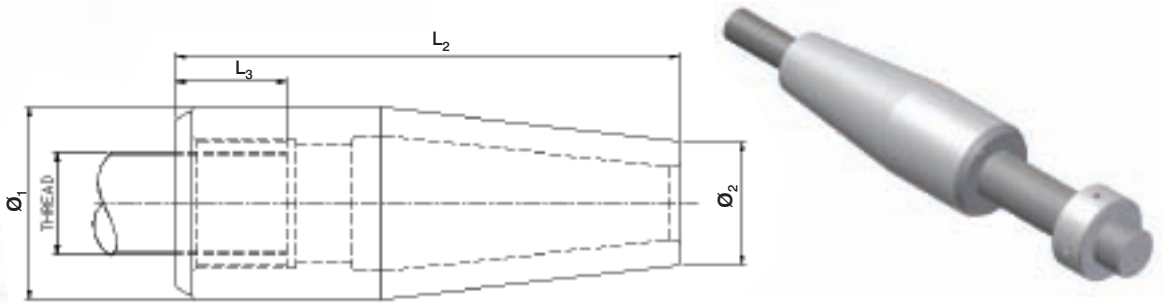
- Suitable for Locked Coil Strand and Spiral Strand
- Architectural socket design
- 100% efficiency, transmits the whole strand force

Steelwork dimensions for guidance purposes:

$Ø_2$ - Recommended hole size in supporting steelwork to suit bearing nut

For strand diameters larger than 150mm contact Bridon.

STYLITE



Stylite Conical Socket (ST-C)

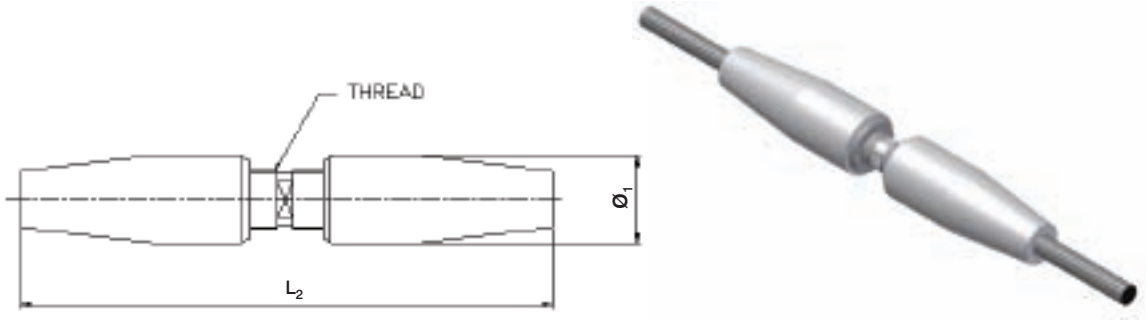
Product Code / Strand Diameter	L_2	L_3	$Ø_1$	$Ø_2$	Thread Size	Weight
mm	mm	mm	mm	mm	Metric	kg
ST-C 25	310	65	87	58	M42 x 4.5	7
ST-C 30	352	72	108	66	M52 x 5.0	12
ST-C 35	404	79	120	74	M60 x 5.5	17
ST-C 40	420	90	135	84	M68 x 6.0	22
ST-C 45	426	96	145	93	M76 x 6.0	28
ST-C 50	447	107	155	102	M80 x 6.0	33
ST-C 55	478	113	170	114	M90 x 6.0	44
ST-C 60	509	119	185	122	M95 x 6.0	54
ST-C 65	545	125	205	130	M105 x 6.0	70
ST-C 70	581	131	220	142	M105 x 6.0	89
ST-C 75	616	136	235	150	M115 x 6.0	106
ST-C 80	657	142	245	159	M120 x 6.0	122
ST-C 85	688	148	265	170	M125 x 6.0	151
ST-C 90	734	159	270	179	M135 x 6.0	163
ST-C 95	765	165	285	187	M140 x 6.0	188
ST-C 100	812	177	300	197	M150 x 6.0	222
ST-C 105	858	183	315	206	M155 x 6.0	258
ST-C 110	899	189	330	214	M165 x 6.0	294
ST-C 115	940	195	345	224	M175 x 6.0	336
ST-C 120	971	201	360	233	M185 x 6.0	375
ST-C 125	1017	212	375	241	M190 x 6.0	412
ST-C 130	1042	212	390	250	M195 x 6.0	468
ST-C 135	1083	218	400	258	M200 x 6.0	508
ST-C 140	1114	224	415	265	M205 x 6.0	562
ST-C 145	1160	230	430	276	M215 x 6.0	629
ST-C 150	1191	236	445	284	M220 x 6.0	689

Figures shown are for guidance purposes only. For details specific to your requirement please contact Bridon.

- Suitable for Locked Coil Strand and Spiral Strand
- Architectural socket design
- 100% efficiency, transmits the whole strand force

For strand diameters larger than 150mm contact Bridon.

STYLITE



Stylite Ring Connector (ST-RC)

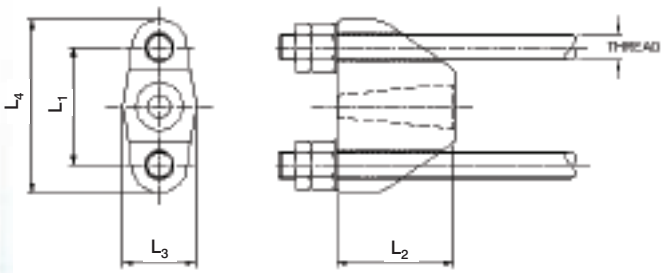
Product Code / Strand Diameter	L_2		Max Adjustment +/-	$Ø_1$	Thread Size	Weight
	Max	Min				
mm	mm	mm	mm	mm	Metric	kg
ST - RC 25	730	640	45	87	M 42 x 4.5	16
ST - RC 30	815	725	45	108	M 52 x 5.0	29
ST - RC 35	925	835	45	120	M 60 x 5.5	39
ST - RC 40	965	875	45	135	M 68 x 6.0	53
ST - RC 45	975	885	45	145	M 76 x 6.0	66
ST - RC 50	1020	930	45	155	M 80 x 6.0	79
ST - RC 55	1085	995	45	170	M 90 x 6.0	105
ST - RC 60	1150	1060	45	185	M 95 x 6.0	128
ST - RC 65	1215	1125	45	205	M 105 x 6.0	166
ST - RC 70	1300	1210	45	220	M 105 x 6.0	205
ST - RC 75	1370	1280	45	235	M 115 x 6.0	244
ST - RC 80	1455	1365	45	245	M 120 x 6.0	281
ST - RC 85	1520	1430	45	265	M 125 x 6.0	343
ST - RC 90	1615	1525	45	270	M 135 x 6.0	376
ST - RC 95	1680	1590	45	285	M 140 x 6.0	432
ST - RC 100	1775	1685	45	300	M 150 x 6.0	512
ST - RC 105	1870	1780	45	315	M 155 x 6.0	590
ST - RC 110	1955	1865	45	330	M 165 x 6.0	675
ST - RC 115	2040	1950	45	345	M 175 x 6.0	772
ST - RC 120	2105	2015	45	360	M 185 x 6.0	866
ST - RC 125	2195	2105	45	375	M 190 x 6.0	951
ST - RC 130	2250	2160	45	390	M 195 x 6.0	1071
ST - RC 135	2335	2245	45	400	M 200 x 6.0	1161
ST - RC 140	2400	2310	45	415	M 205 x 6.0	1280
ST - RC 145	2495	2405	45	430	M 215 x 6.0	1434
ST - RC 150	2560	2470	45	445	M 220 x 6.0	1567

Figures shown are for guidance purposes only. For details specific to your requirement please contact Bridon.

- Suitable for Locked Coil Strand and Spiral Strand
- Architectural socket design
- 100% efficiency, transmits the whole strand force

For strand diameters larger than 150mm contact Bridon.

STYLITE



Stylite Block Socket (ST-B)

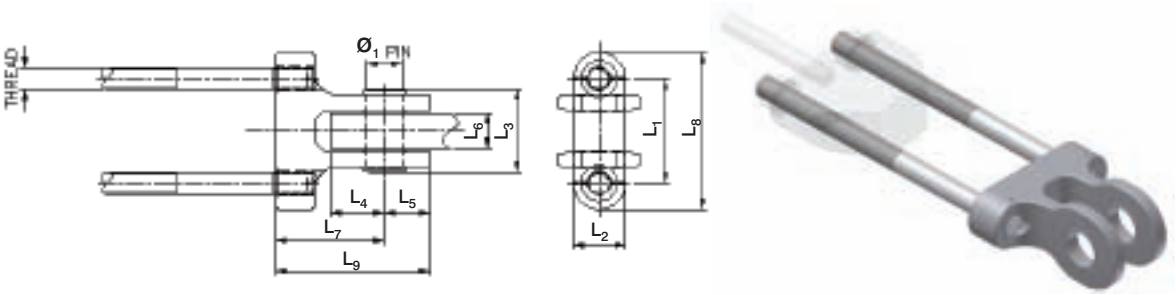
Product Code / Strand Diameter	L_1	L_2	L_3	L_4	Thread Size	Weight
mm	mm	mm	mm	mm	Metric	kg
ST-B 25	160	185	87	232	M 30 x 3.5	15
ST-B 30	180	220	105	264	M 36 x 4.0	24
ST-B 35	200	255	125	296	M 42 x 4.5	37
ST-B 40	215	260	140	327	M 48 x 5.0	47
ST-B 45	250	265	145	378	M 56 x 5.5	62
ST-B 50	260	265	155	404	M 64 x 6.0	72
ST-B 55	300	290	170	444	M 64 x 6.0	95
ST-B 60	320	315	185	480	M 68 x 6.0	123
ST-B 65	340	340	205	500	M 76 x 6.0	143
ST-B 70	385	365	220	565	M 80 x 6.0	195
ST-B 75	390	395	240	570	M 85 x 6.0	218
ST-B 80	400	415	245	600	M 90 x 6.0	256
ST-B 85	430	440	265	630	M 95 x 6.0	300
ST-B 90	475	465	270	695	M 100 x 6.0	368
ST-B 95	480	495	285	700	M 105 x 6.0	400
ST-B 100	560	520	300	800	M 110 x 6.0	528
ST-B 105	565	545	315	815	M 115 x 6.0	584
ST-B 110	570	570	330	830	M 120 x 6.0	643
ST-B 115	580	595	345	860	M 125 x 6.0	736
ST-B 120	585	620	360	875	M 130 x 6.0	805
ST-B 125	590	645	375	890	M 135 x 6.0	875
ST-B 130	630	670	390	945	M 140 x 6.0	1010
ST-B 135	650	695	400	970	M 145 x 6.0	1106
ST-B 140	670	720	415	1000	M 150 x 6.0	1226
ST-B 145	695	750	430	1035	M 155 x 6.0	1369
ST-B 150	720	775	445	1070	M 160 x 6.0	1509

Figures shown are for guidance purposes only. For details specific to your requirement please contact Bridon.

- Suitable for Locked Coil Strand and Spiral Strand
- Architectural socket design
- 100% efficiency, transmits the whole strand force

For strand diameters larger than 150mm contact Bridon.

STYLITE



Stylite Crossheads (ST-CH)

Product Code / Strand Diameter	L_1	L_2	L_3	L_4	L_5	L_6		L_7	L_8	L_9	$Ø_1$		Thread Size
						Max	Min				Pin	Pin Hole	
mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	Metric
ST-CH 25	160	72	121	73	66	56	55	145	232	211	45	46	M 30 x 3.5
ST-CH 30	180	84	154	86	74	71	68	170	264	244	55	56	M 36 x 4.0
ST-CH 35	200	96	175	100	87	85	79	210	296	297	65	66	M 42 x 4.5
ST-CH 40	215	112	187	120	98	90	82	225	327	323	75	76	M 48 x 5.0
ST-CH 45	250	128	210	124	106	95	90	250	378	356	80	81	M 56 x 5.5
ST-CH 50	260	144	221	144	120	100	93	280	404	400	90	91	M 64 x 6.0
ST-CH 55	300	144	233	155	132	110	100	310	444	442	100	101	M 64 x 6.0
ST-CH 60	320	160	250	168	141	120	110	335	480	476	110	111	M 68 x 6.0
ST-CH 65	340	160	267	187	155	129	115	365	500	520	120	121	M 76 x 6.0
ST-CH 70	385	180	285	202	167	137	125	390	565	557	130	131	M 80 x 6.0
ST-CH 75	390	180	307	211	175	147	135	410	570	585	135	136	M 85 x 6.0
ST-CH 80	400	200	322	226	188	157	145	440	600	628	145	146	M 90 x 6.0
ST-CH 85	430	200	348	240	203	167	155	470	630	673	155	156	M 95 x 6.0
ST-CH 90	475	220	366	255	216	178	165	500	695	716	165	166	M 100 x 6.0
ST-CH 95	480	220	383	274	232	186	175	525	700	757	175	176	M 105 x 6.0
ST-CH 100	560	240	421	294	245	197	185	565	800	810	185	186	M 110 x 6.0
ST-CH 105	565	250	438	298	252	206	195	580	815	832	190	191	M 115 x 6.0
ST-CH 110	570	260	458	318	262	215	205	605	830	867	200	201	M 120 x 6.0
ST-CH 115	580	280	474	332	277	225	215	635	860	912	210	211	M 125 x 6.0
ST-CH 120	585	290	482	347	289	235	225	660	875	949	220	221	M 130 x 6.0
ST-CH 125	590	300	501	361	303	245	230	680	890	983	230	231	M 135 x 6.0
ST-CH 130	630	315	524	396	273	257	240	676	945	949	235	237	M 135 x 6.0
ST-CH 135	650	325	539	410	279	267	250	715	975	994	240	242	M 140 x 6.0
ST-CH 140	670	340	557	430	290	277	260	740	1010	1030	250	252	M 145 x 6.0
ST-CH 145	695	345	575	445	306	287	270	775	1040	1081	260	262	M 150 x 6.0
ST-CH 150	720	360	587	465	315	297	280	800	1080	1115	270	272	M 155 x 6.0

Figures shown are for guidance purposes only. For details specific to your requirement please contact Bridon.

- Suitable for Locked Coil Strand and Spiral Strand
- Architectural socket design
- 100% efficiency, transmits the whole strand force

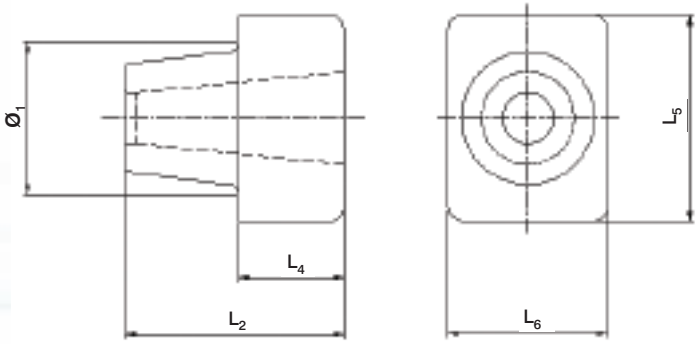
Steelwork dimensions for guidance purposes:

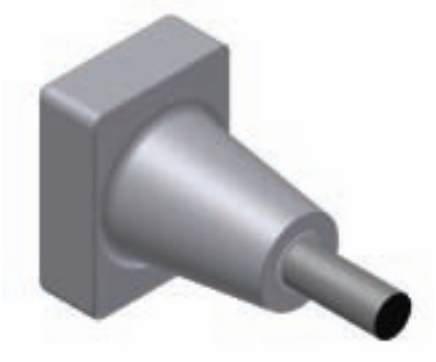
L_4 maximum swing of connecting linkage

L_6 width of connecting steelwork including protective coating e.g. paint, galvanising, etc.

For strand diameters larger than 150mm contact Bridon.

STYLITE





Stylite Hammerhead Socket (ST-H)

Product Code / Strand Diameter	L_2	L_4	L_5	L_6	$Ø_1$	Weight
mm	mm	mm	mm	mm	mm	kg
ST-H 50	265	70	240	185	170	30
ST-H 55	290	75	265	205	185	38
ST-H 60	315	80	285	225	200	48
ST-H 65	340	85	310	245	210	61
ST-H 70	370	90	335	260	225	74
ST-H 75	395	95	360	280	250	91
ST-H 80	420	100	380	300	260	109
ST-H 85	445	110	405	315	270	130
ST-H 90	475	115	430	335	290	155
ST-H 95	500	120	455	355	305	186
ST-H 100	525	125	475	370	315	209
ST-H 105	550	130	500	390	340	243
ST-H 110	580	140	525	410	350	282
ST-H 115	605	145	550	430	360	320
ST-H 120	630	150	570	445	375	362
ST-H 125	655	160	595	465	395	417
ST-H 130	685	190	620	485	405	496
ST-H 135	710	210	645	500	410	575
ST-H 140	735	215	665	520	430	639
ST-H 145	760	220	690	540	440	701
ST-H 150	790	230	715	555	455	780

Figures shown are for guidance purposes only. For details specific to your requirement please contact Bridon.

- Suitable for Locked Coil Strand and Spiral Strand
- Architectural socket design
- 100% efficiency, transmits the whole strand force

For strand diameters larger than 150mm contact Bridon.

STYLITE

Non Standard Stylite Sockets

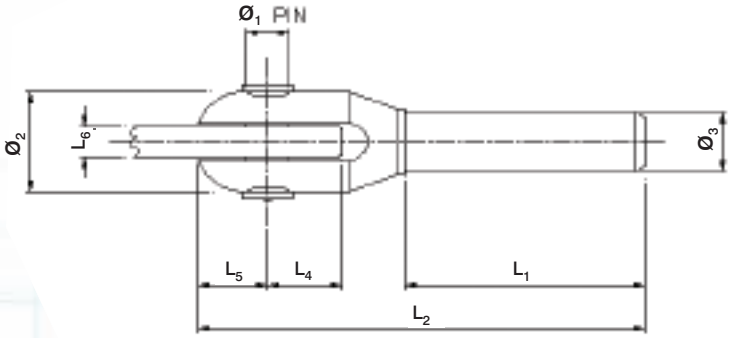
In special circumstances it may not be possible to use any of the Stylite sockets contained within the standard range. As all Bridon sockets are designed in-house we have the ability to consider any request and can engineer a solution tailored for a particular need. An illustration of some recent examples are shown, for project specific advice, please contact Bridon.

Rotating joint with pull-in lugs attached to enable installation and tensioning of cable system.

Round Hammerhead Socket used as tower connection in cable stayed bridges.

Bracing system using locked coil strand.

Cylindrical Socket with spherical seating to allow for small mis-alignments in connecting steelwork



Swaged Fork Sockets (SW-F)

Product Code / Strand Diameter	L_1	L_2	L_4	L_5	L_6	$Ø_1$ Pin	$Ø_2$	$Ø_3$
mm	mm	mm	mm	mm	mm	mm	mm	mm
SW-F 13	138	263	40	40	18.5	22	58	29.5
SW-F 16	170	309	48	46	20.5	25	63	36.1
SW-F 19	203	373	55	56	24	30	78	39.4
SW-F 22	227	407	64	61	27	33	83	45.7
SW-F 25	262	457	69	67	31	36	93	52
SW-F 30	302	537	87	80	36	45	108	65
SW-F 35	336	621	104	97	47	55	133	72

Figures shown are for guidance purposes only. For details specific to your requirement please contact Bridon.

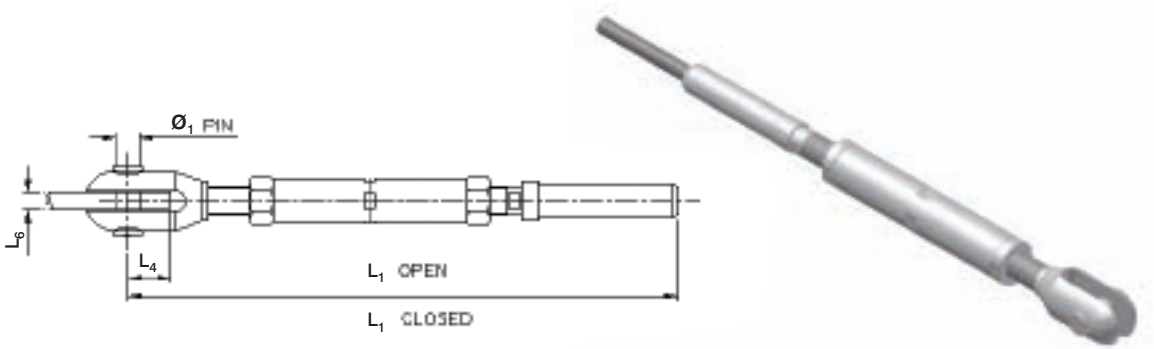
- Suitable for Spiral Strand with diameters up to 35mm
- Architectural socket design
- 100% efficiency, transmits the whole strand force
- Not suitable for Locked Coil Strand

Steelwork dimensions for guidance purposes:

L_4 maximum swing of connecting linkage

L_6 width of connecting steelwork including protective coating e.g. paint, galvanising, etc.

STYLITE



Swaged Adjustable Fork Socket (SW-AF)

Product Code / Strand Diameter	L_1		L_4	L_6	$Ø_1$ Pin	Take Up
	Open	Closed				
mm	mm	mm	mm	mm	mm	mm
SW-AF 13	550	400	40	18.5	22	150
SW-AF 16	559	409	48	20.5	25	150
SW-AF 19	719	519	55	24	30	200
SW-AF 22	739	539	64	27	33	200
SW-AF 25	893	643	69	31	36	250
SW-AF 30	955	705	87	36	45	250
SW-AF 35	1118	818	104	47	55	300

Figures shown are for guidance purposes only. For details specific to your requirement please contact Bridon.

- Suitable for Spiral Strand with diameters up to 35mm
- Architectural socket design
- 100% efficiency, transmits the whole strand force
- Not suitable for Locked Coil Strand

Steelwork dimensions for guidance purposes:

L_4 maximum swing of connecting linkage

L_6 width of connecting steelwork including protective coating e.g. paint, galvanising, etc.

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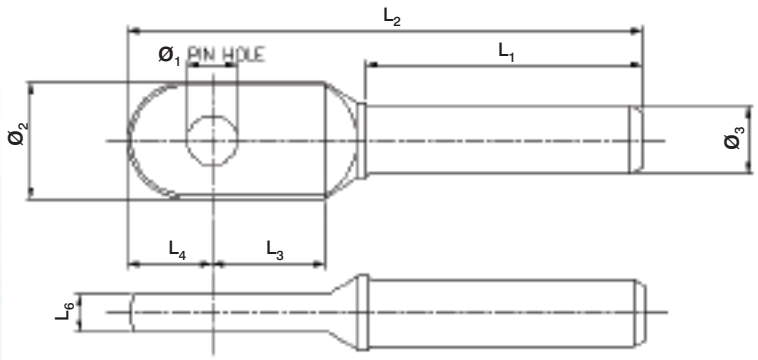

Swaged Closed Sockets (SW-C)

Product Code / Strand Diameter	L_1	L_2	L_3	L_4	L_6	$Ø_1$ Pin Hole	$Ø_2$	$Ø_3$
mm	mm	mm	mm	mm	mm	mm	mm	mm
SW-C 13	138	263	53	40	18	23	53	29.5
SW-C 16	170	309	60	46	20	27	62	36.1
SW-C 19	203	373	75	56	25	32	78	39.4
SW-C 22	227	407	80	61	25	35	84	45.7
SW-C 25	262	457	88	67	30	38	94	52
SW-C 30	302	537	105	80	35	47	109	65
SW-C 35	336	621	130	97	45	57	133	71

Figures shown are for guidance purposes only. For details specific to your requirement please contact Bridon.

- Suitable for Spiral Strand with diameters up to 35mm
- Architectural socket design
- 100% efficiency, transmits the whole strand force
- Not suitable for Locked Coil Strand

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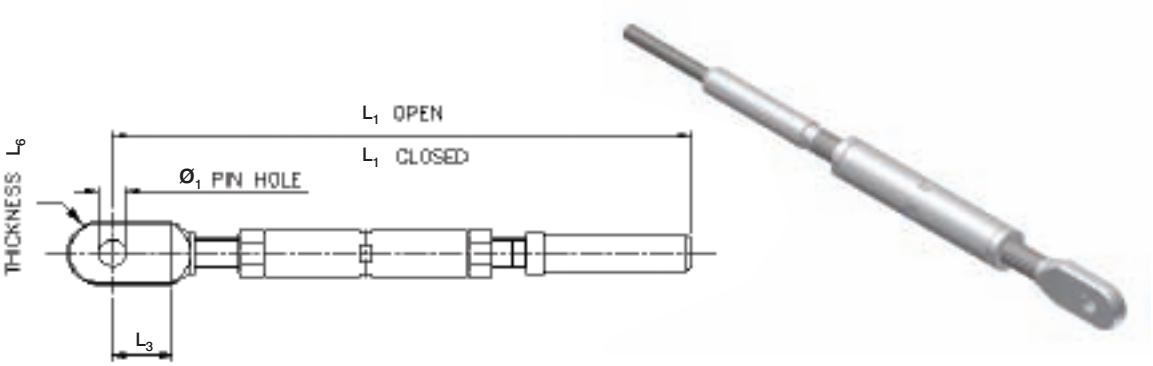


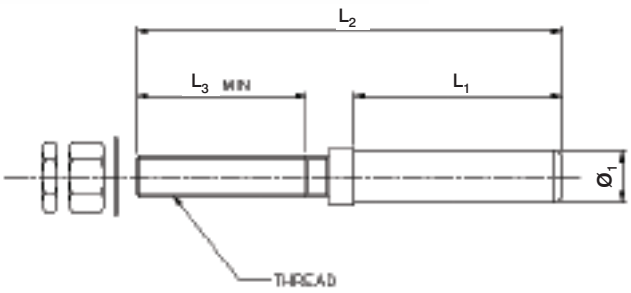
Swaged Adjustable Closed Sockets (SW-AC)

Product Code / Strand Diameter	L_1		L_3	L_6	$Ø_1$ Pin Hole	Take Up
	Open	Closed				
mm	mm	mm	mm	mm	mm	mm
SW-AC 13	545	395	53	18	23	150
SW-AC 16	559	409	60	20	27	150
SW-AC 19	714	514	75	25	32	200
SW-AC 22	739	539	80	25	35	200
SW-AC 25	893	643	88	30	38	250
SW-AC 30	955	705	105	35	47	250
SW-AC 35	1128	828	130	45	57	300

Figures shown are for guidance purposes only. For details specific to your requirement please contact Bridon.

- Suitable for Spiral Strand with diameters up to 35mm
- Architectural socket design
- 100% efficiency, transmits the whole strand force
- Not suitable for Locked Coil Strand

STYLITE



Swaged Stud Socket (SW-S)

Product Code / Strand Diameter	L_1	L_2	L_3	$Ø_1$	Thread Size
mm	mm	mm	mm	mm	Metric
SW-S 13	138	263	135	30	M27 x 3
SW-S 16	170	309	135	37	M30 x 3.5
SW-S 19	203	373	175	40	M36 x 4
SW-S 22	227	407	180	46	M39 x 4
SW-S 25	262	457	225	52	M48 x 5
SW-S 30	302	537	245	65	M56 x 5.5
SW-S 35	336	621	285	72	M64 x 6

Figures shown are for guidance purposes only. For details specific to your requirement please contact Bridon.

- Suitable for Spiral Strand with diameters up to 35mm
- Architectural socket design
- 100% efficiency, transmits the whole strand force
- Not suitable for Locked Coil Strand

Non Standard Swaged Sockets

In special circumstances it may not be possible to use any of the swaged sockets contained within the standard range. As all Bridon sockets are designed in-house, we have the ability to consider any request and can engineer a solution tailored for a particular need. An illustration of some recent examples are shown, for project specific advice, please contact Bridon.

Elongated Swaged Stud Socket to provide extra length adjustment.

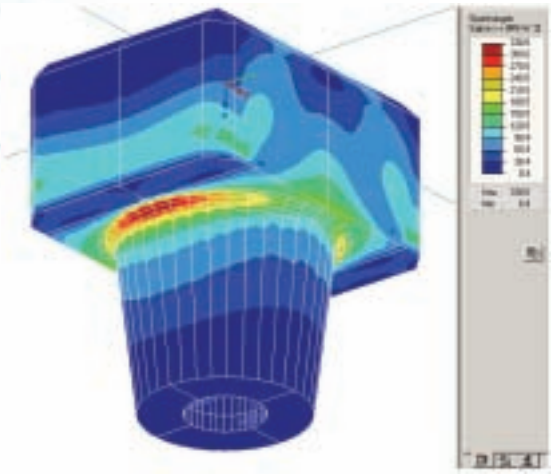
Swaged Stud with spherical seating to allow for small mis-alignments in connecting steelwork

Rotating fork joint to allow for multiple degrees of freedom.

Swaged Adjustable Fork Socket to provide small amount of length adjustment.

Bridon's aim is to assist with your project from the initial concept through the detailed design and ultimate construction. To achieve this aim, certain technical information is pre-requisite.

Bridon manufactures in accordance with all major international standards and combines them with a series of proven in house procedures and specifications. For specific technical advice, please refer to Bridon.

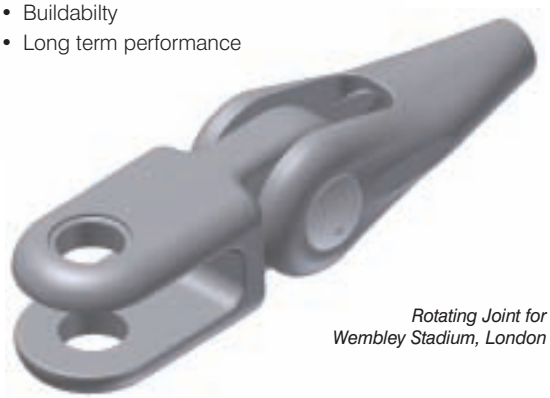


FEA on Hammerhead Socket

Planning

Bridon manufacture the widest range of cable products for the structural market and therefore are able to offer an unbiased assessment of which particular system is most suited to each application. Bridon are able to assist with the following:

- Feasibility studies, including cost estimates
- Technical information
- Maintenance advice
- Steelwork interface details
- Installation schemes
- Buildabilty
- Long term performance



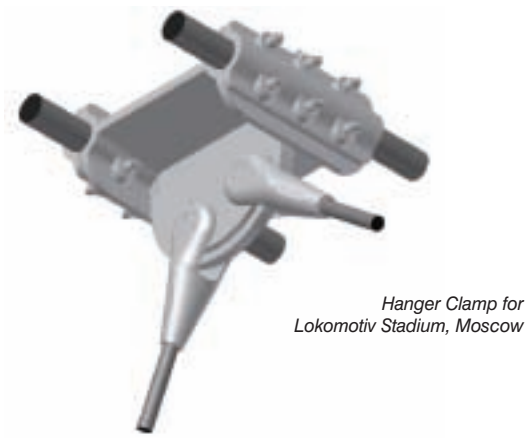
Rotating Joint for Wembley Stadium, London

Design

All components are designed in-house. This allows Bridon to continually develop its range of cables, end fittings and other components. Bridon have total control of the supply chain from ordering the raw material through to installing the completed system and are able to provide bespoke solutions.

Our service includes but is not limited to the following:

- Strand design
  Bridon design all strand to meet client requirements. As no two projects are the same, one-off strand designs can be produced to cater for special needs. Our existing in house knowledge of cable design and manufacture is now suplemented by the use of ABAQUS® finite element analysis software which allows us to examine the internal stresses within a cable whilst considering critical properties and long term performance. The strand properties shown in the tables can be used as a guide.
- End termination design
  Bridon design all sockets in house. By using autodesk® inventor™ 3-d modelling software to assist in the process of designing, the external shape can be altered to provide a level of aesthetics not normally associated with this type of product. The 3-d model produced by Bridon can be incorporated into the overall design to check for proper interface with connecting steelwork. A finite element analysis can be carried out on the 3-d model using our ABAQUS® software, this allows physical dimensions to be optimised. In addition to the Stylite range shown in the tables, Bridon are able to cater for other project-specific needs.
- Bespoke design
  Cutting edge architecture can lead to new solutions for product design. Just because something has not been done before does not mean it can't be done. Bridon have provided unique solutions for many world famous structures



Hanger Clamp for Lokomotiv Stadium, Moscow

Knowledge

Bridon are continually enhancing the product range to meet the demands of modern structural requirements. In addition to using the latest design tools, we also have the benefit of decades of experience in the manufacture and testing of cable systems. Our large database of past test results can be used to estimate long term properties such as creep, coefficient of friction, claming forces, minimum bending diameters, fatigue, etc. For example, our large database of tension-tension fatigue test results allows us to derive product specific S-N curves.

Use of this knowledge bank can eliminate the need to carry out certain tests up-front, providing designers with a degree of confidence in the performance of materials integral to their design and also removes the need for contractors to carry out expensive product testing.

Corrosion Protection of Strand

The corrosion protection of structural strand is of paramount importance. In order to ensure the optimum corrosion protection system a series of measures and options can be selected.

These can be categorised into the following five main stages:

Stage 1 – Individual Wires

The individual wires are protected by means of a factory applied zinc or zinc alloy coating using the hot dip process. Such coatings provide sacrificial protection to the underlying carbon steel wire.

Wires are available heavy galvanised or Galfan® coated. The coating is applied by the hot dip process under factory controlled conditions.

Galfan® coated wires offer a multifold increase in corrosion protection when compared with the same thickness zinc coated wire. The exact value of the increase depends upon local environmental factors.

Galfan® is a binary alloy of zinc and aluminium at the eutectic ratio of 95% zinc and 5% aluminium and is also applied by means of the hot dip process.

For spiral strand cables it is necessary to Galfan® coat all wires, for locked coil cables it is only necessary to Galfan® coat the outer two layers of shaped wire.

Galvanising of wire

There has been industry concern about the subject of potential carbon steel wire and rod failure due to the effect known as hydrogen embrittlement during galvanising.

The hot dip galvanising process employed by Bridon is unaffected by the phenomenon of hydrogen embrittlement. No instances of failure attributed to hydrogen embrittlement in Bridon's carbon steel wire have been recorded.

Stage 2 – Strand Interior

During strand spinning, various compounds can be applied to fill the voids and coat the wires in order to enhance corrosion protection. The compounds most readily used for spiral strand and locked coil strand are Bridon Metalcoat, Bridon Brilube 2 and zinc dust compound. These compounds are also designed to act as a long-term lubricant, reducing inter-wire friction and hence prolonging strand-life.

It should be noted that structural strand may exude minor amounts of these compounds under load. Therefore for certain applications, Bridon recommend that spinning compound is not used on spiral strand and is only used up to the final two layers on locked coil strand.

Application of spinning compound

When selecting the strand interior compound, care should be taken to ensure compatibility with any externally applied coating.

Stage 3 – Strand Exterior

The "as – supplied" strand will have a dry surface. Additional material can be painted onto the outside of the strand to provide an extra level of corrosion protection. Bridon recommend the use of Metalcoat.

Painting of strand on Millennium Bridge, London

Bridon Metalcoat® was specifically designed to protect structural strand against corrosion and is a suspension of aluminium flake incorporated into a hydrocarbon resin carrier, diluted with a solvent for ease of application. The product is hand applied on site and does not dry hard like conventional paint systems. Although dry to touch, it remains flexible allowing for the differential wire movement as the underlying cables are tensioned in-service, thus eliminating surface cracking. When selecting the external coating care should be taken to ensure compatibility with the internal compound.

Stage 4 – Structural Design

Preventing localised corrosion points within the strand system can be addressed during the design phase. For example, items such as saddles and clamps must be designed to prevent build-up of moisture. Bridon is pleased to offer advice on this highly project specific subject.

Stage 5 – Planned Maintenance Programme

The success of any corrosion protection system depends on the routine maintenance it receives after installation.

When Bridon Metalcoat® is used on the strand exterior we would recommend the following planned maintenance programme is adopted.

Inspection Number	Recomendations
1 (Interim Inspection)	Usually conducted within 5 years of initial coating. Localised areas of discoloration require removal of existing material and a “touch-up”.
2 (Major Inspection)	Usually conducted within 10/15 years of initial coating. Complete re-coating of the strand surface is a likely requirement.

Subsequent inspections should be programmed for similar intervals during the structure lifespan.

This maintenance programme broadly mirrors the planned inspection and maintenance programmes laid down for most major cable supported structures. If the above programme is adopted, we would expect the underlying steel wires to be unaffected by corrosion during the lifespan of the structure. The above maintenance periods are given as indicative and are applicable for the majority of structures. However, they do not take into account specific instances of mechanical damage to the strand and / or other unique environmental hazards (e.g. chemical emissions, aggressive coastal locations etc.)

Bridon is able to provide a variety of inspection regimes specific to structural cable systems using on-site and laboratory, mechanical and non destructive testing (NDT) methods. Please contact us to discuss your specific project requirements.

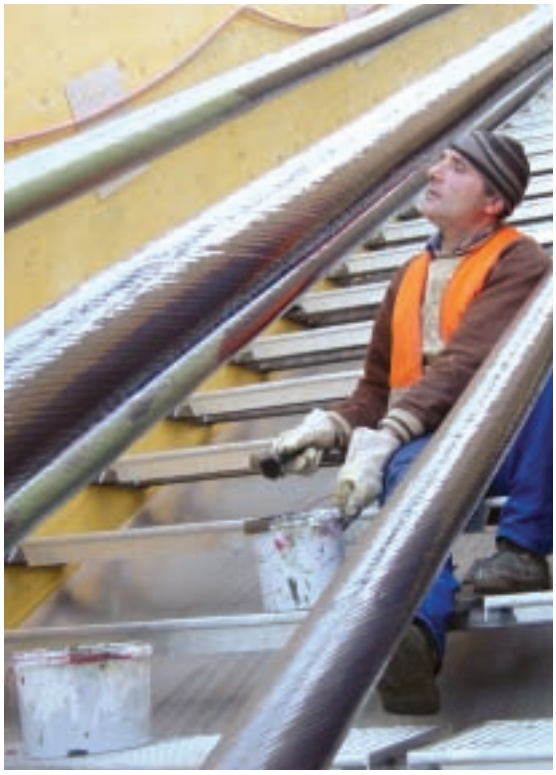
Corrosion Protection of Sockets and Clamps

Sockets and clamps need to have the same level of corrosion protection as the strand. The primary corrosion protection of sockets and clamps is provided by applying a zinc coating either using the hot-dip process or by hot metal spraying.

The galvanising is in accordance with ISO EN 1461 with a minimum thickness of 150 microns.

As with the strand, additional protection can be obtained by further coating the socket with Metalcoat® if required.

It is not possible to galvanise certain components as the zinc will interfere with their proper functioning. To allow these components to function properly during their operation, the long-term corrosion protection is applied on site after final tensioning. This can be done by coating the exposed areas with a compound such as Metalcoat®.



Painting of LC strand on Cable Stayed Bridge, Dusseldorf - Flehe

Strand Diameter

The common value for all design standards is the minimum breaking load (MBL) which is the load that will always be achieved in a breaking load test. The MBL is also referred to in some design standards as the characteristic breaking load or as the nominal cable strength.

Eurocode 3 (pr EN 1993):
Design of steel structures Part 1.11: Design of structures with tension components This design standard uses the partial safety factor philosophy which is also refered to as "load resistance factor design" (LRFD). The design resistance of a cable $Z_{R,d}$ subjected to a static load is calculated by dividing the MBL by the partial safety factor of 1.5*1.1=1.65. If we take the example of a 60 mm diameter locked coil strand "LC-60" the minimum breaking load is 3600 kN, therefore the design resistance is $Z_{R,d}$=3600 kN/1.5/1.1=2182 kN.
The applied loads are also multiplied by safety factors (e.g. 1.35 for dead loads and 1.50 for live loads) which can be found in the national annexes to Eurocode 3. The static calculation for different load combinations then gives the design strand tensions $N_{R,d}$.

The design strand tension $N_{R,d}$ must be smaller than or equal to the design resistance $Z_{R,d}$.

ASCE 19-96:
Structural Applications of Steel Cables for Buildings This design standard uses the single safety factor philosophy which is also refered to as "allowable stress design" (ASD).

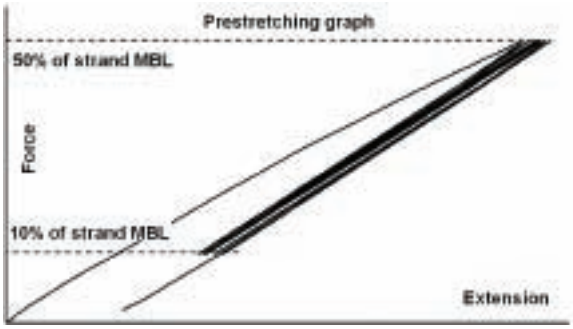
The static calculation for different load combinations gives the strand tensions which are multiplied by safety factors (2.0 or 2.2, depending on the load combination). The result of this multiplication is required to be smaller than the MBL.

Large diameter spiral strands (d>35mm) and locked coil strand are designed and made for each particular application. The diameters listed in the tables of this brochure are just examples and any intermediate diameters can be manufactured. If a range of different diameters is needed, early consultation with Bridon will lead to an optimised solution in terms of both product and cost.

Prestretching, Measurement and Modulus

For structural design, it is sometimes important to predict exact cable length under load. This is best achieved by prestretching a cable which eliminates the constructional stretch, leading to uniform cable characteristics, a stable elastic strand modulus (E) and improved fatigue performance. It is also possible to calculate the cable length using either historical data or by carrying out a test on a sample length.

Strand prestretching is conducted using a series of cyclic loadings, typically between 10% and 50% of the strand minimum breaking force. The elastic strand modulus (E) is measured during the final prestretching cycle.



After prestretching the load is taken to the specified marking load. The prescribed strand lengths and the position of intermediate datum points are then marked on the strand. Additionally, an axial line is applied to the strand to highlight socket orientation during manufacturing and on site.

The elastic strand modulus varies with different strand types.

Cable Type and Size	Nominal Elastic Strand Modulus kN/mm²
Spiral Strand	
<30 mm	175 ±10
31 – 45 mm	170 ±10
46 – 65 mm	165 ±10
66 – 75 mm	160 ±10
>76 mm	155 ±10
Locked Coil Strand	
All sizes	165 ±10

Bridon's prestretching facilities include a 730 metre long track, capable of applying loads up to 4600 kN which allows full prestretching of strands up to 100 mm diameter. Strands longer than 730 metres can be prestretched in several operations and strands larger than 100mm diameter can be prestretched to a value lower than 50% of the minimum breaking force.

As every project is unique, we require project specific information from the Engineer/Client. To ensure accuracy of production, strand length and the position of intermediate datum points at a given load and temperature are needed.

In addition to the permanent extension removed during prestretching, long term strand creep should also be considered. The permanent extension of a prestretched strand, due to creep, will typically be about 0.15 mm/m when held at a constant load of 42% of calculated breaking load or 45% of minimum breaking load. This can be accounted for by marking the strand shorter after prestretching.

Thermal and Elastic Expansion and Contraction

The change in length of strand produced by a change in temperature will be:

$\Delta L_T = \alpha * L_0 * \Delta T$

where

α = coefficient of linear expansion (12.5×10^{-6} / K)

L_0 = original length of cable in metres

ΔT = change in temperature

The elastic elongation of a strand produced by a change in load will be:

$\Delta L_E = (\Delta W * L_0) / (E * A)$

where

ΔW = change in load

E = elastic strand modulus

A = metallic cross section

Socket Fitting

All Bridon strands are fitted with sockets inside the factory. Factory fitting ensures that this critical operation takes place in a controlled environment ensuring consistently high quality with no outside influences. The sockets are permanently attached to the strand which guarantees the integrity is maintained during subsequent transportation to site, installation and tensioning.

There are two principle methods of terminating structural strand. The method employed is determined, in general, by the diameter and construction of the strand.

Swaging of socket

For spiral strand up to approximately 35mm diameter, the preferred method of termination is by means of a swaged socket. The strand end is located inside the hollow section of the socket shank. The shank is then pressed onto the strand using a hydraulic press and special dies. Sockets are manufactured from special quality steel which is suitable for cold forming. Exact procedures are followed ensuring the performance of the assembly is not reduced by the swaging process.

Following swaging, the cable assembly will develop 100% of the strand catalogue minimum breaking strength.

For larger diameter spiral strand and locked coil strands, the preferred method of termination is by speltering. The strand end is opened to form a “brush”. It is positioned inside the internal conical profile of the socket, which is then filled with either zinc alloy or polyester resin.

Preparation of “brush”

The cone which is formed, provides the mechanism for load transfer between strand and socket. To ensure optimum in-service fatigue performance, the alignment and concentricity of socket and strand is essential. This is achieved by using specially designed equipment and procedures. Socketing is carried out in accordance with Bridon Company Standards. Our socketing procedures comply with all major International Standards e.g. EN 13411–4 with additional measures included, based upon our experience.

Following the attachment of the socket, the assembly will develop 100% of the strand catalogue minimum breaking strength.

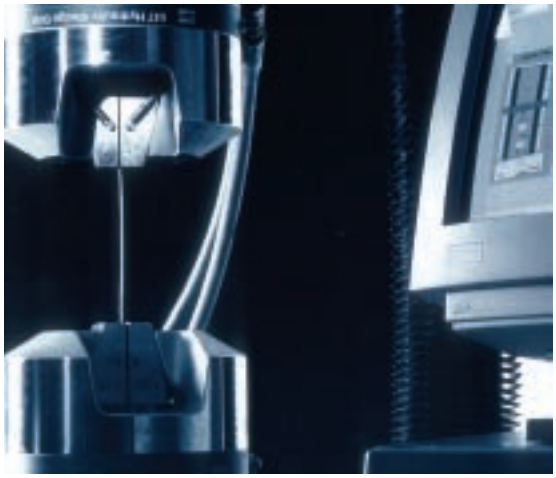
Filling of socket with zinc alloy

Quality Assurance

Bridon standard practice is to provide a certificate of conformity for supplied goods ensuring that all material is fully traceable.

Wire

Wire is manufactured and inspected in accordance with EN 12385-10 unless other specifications are agreed.



Wire tensile test

The following aspects may be tested on the galvanised wire:

- Diameter
- Tensile strength
- Percentage elongation
- Ductility wrap
- Zinc weight
- Adherence wrap
- Chemical composition

Strand

Strand is manufactured and inspected in accordance with EN 12385-10 unless other specifications are agreed.

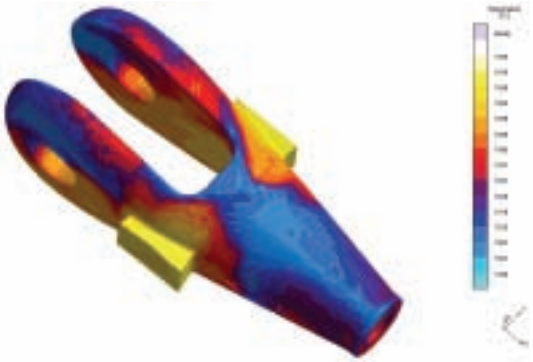
Bridon is able to perform the following tests on strands and completed cable assemblies:

- Tensile test to demonstrate the strand minimum breaking strength and the modulus of elasticity
- Project specific tensile test with type sockets to demonstrate the cable assembly minimum breaking load
- Tension-tension strand fatigue test with type sockets to demonstrate the cable assembly fatigue performance

Strand breaking load test

Sockets

The chemical composition and the mechanical properties are tested on each single cast of metal.



Thermal modelling of socket during casting

Cast materials shall additionally be tested by non-destructive methods as follows:

Radiography

Prototype castings are subjected to radiography to validate the method of manufacture.

Ultrasonic inspection

Cast components shall be subjected to ultrasonic inspection after final heat treatment on a sample basis.

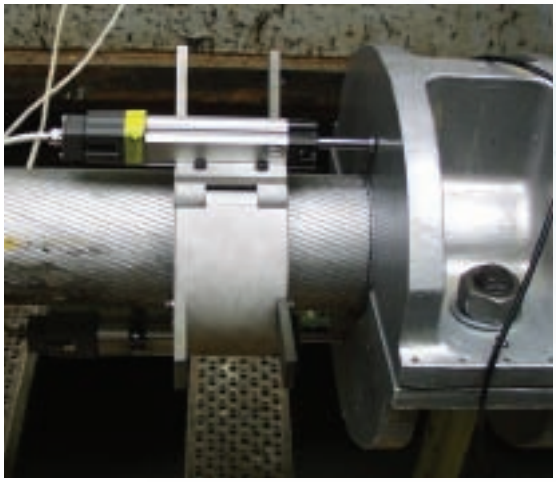
Magnetic particle inspection / Dye penetrant

Every cast component shall be subjected to magnetic particle or dye penetrant inspection after final heat treatment.

Clamps

All cast steel clamps are subject to the same testing regime as the sockets.

In addition to material testing, clamp slip tests can be carried out to verify the efficiency of the clamp.



Clamp slip test

Strand Catenary Calculations

When strands are used in level or inclined spans, the shape taken by the strand is a catenary. If individual unit loads are attached between the supports as in the case of a suspension bridge, then the strand will form a series of catenaries. For most practical cases where the sag to span ratio is low, it may be assumed that the form taken by the strand is that of a parabolic arc. The following formulae are based on this assumption.

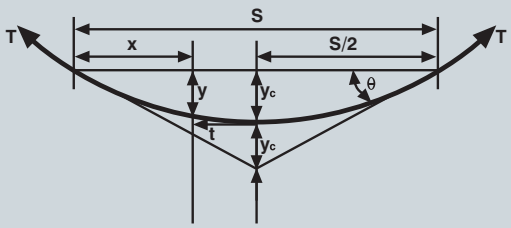
In the case of anchored spans it is also assumed that there is no displacement of supports under increased load. If displacements occur the result is larger sag. The slight error in the load calculation will result in greater degree of safety for the cable assembly than that calculated.

Where multiple loads are suspended in a span, a reasonable accuracy can be obtained by assuming the system to be uniformly loaded, and adding the weight per metre of the applied loads to that of the strand.

For wind loads, the pressure may be taken as 0.01 kg/cm^2 at a wind speed of 150 km/h on the projected area of the cable. Under ice conditions, the radial thickness may be as high as 15 mm and the weight of ice 0.9 g/cm^3. Under combined wind and ice conditions, it should be assumed that the wind is acting on the combined ice and cable diameter, and the resulting force should then be found and used as the combined weight per metre.

Horizontal catenary

Level Span - Uniformly Loaded



Calculation:

horizontal tension $t = \frac{WS^2}{8y_c}$ or $y_c = \frac{WS^2}{8t}$

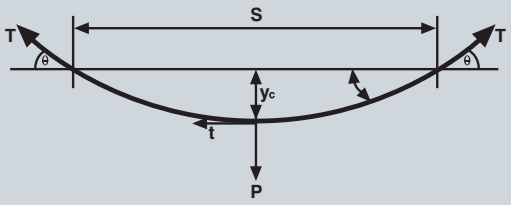
maximum tension $T = \frac{t}{\cos\theta}$ where $\tan\theta = \frac{4y_c}{S}$

vertical deflection at any point in span

$$y = \frac{W \times (S - x)}{2t}$$

length of rope $L = S + \frac{8y_c^2}{3S}$ **(approximately)**

Level Span - Single Load at Centre

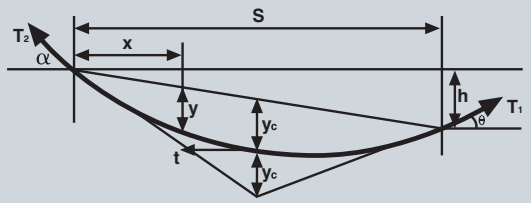


Calculation:

horizontal tension $t = \frac{S(2P+WS)}{8y_c}$ or $y_c = \frac{S(2P+WS)}{8t}$

maximum tension $T = \frac{t}{\cos\theta}$ when $\tan\theta = \frac{P+WS}{2t}$

Inclined Span - Uniformly Loaded



h = vertical difference between supports

L = length of cable in catenary

P = point load on cable

S = horizontal length of span

t = horizontal component of cable tension

T = actual cable tension

W = weight of horizontal length of uniformly distributed load

y = vertical sag measured from the chord

- and α = approach angles of cable at supports

Calculation:

horizontal tension t = $\frac{WS^2}{8y_C}$ or $y_C = \frac{WS^2}{8t}$

and $T_1 = \frac{t}{\cos\theta}$ when $\tan\theta = \frac{4y_C - h}{S}$

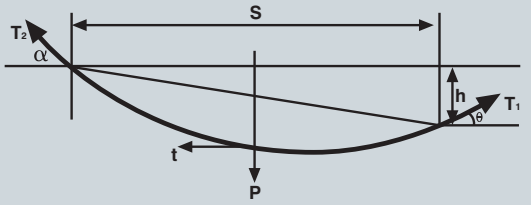
and $T_2 = \frac{t}{\cos\alpha}$ when $\tan\alpha = \frac{4y_C + h}{S}$

vertical deflection at any point in span

$$y = \frac{W \times (S - x)}{2t}$$

length of rope L = $\left(1 + \frac{8y^2}{3S^2}\right)\sqrt{\left(S^2 + h^2\right)}$

Inclined Span - Single Load at Centre



Calculation:

horizontal tension t = $\frac{S(2P+WS)}{8y_C}$ or $y_C = \frac{S(2P+WS)}{8t}$

and $T_1 = \frac{t}{\cos\theta}$ when $\tan\theta = \frac{P+WS}{2t} - \frac{h}{S}$

and $T_2 = \frac{t}{\cos\alpha}$ when $\tan\alpha = \frac{P+WS}{2t} + \frac{h}{S}$

Inclined catenary

Packaging and Handling

The correct packaging, transport, storage and handling of cable assemblies is critical to ensure that the customer receives the product in first class condition. For specific advice on all aspects of strand lifting and handling, particularly where safety is a concern, contact Bridon.

Cable assemblies are normally supplied in coils or on reels. To avoid possible wire displacement in the strand, Bridon recommend the following minimum coil diameters:

Locked Coil Strand	**30 x strand diameter**
Spiral Strand	**24 x strand diameter**

Coils can be wrapped in polyweave plastic to prevent contamination from foreign bodies such as dust, sand etc. It is usual for fitted sockets to protrude outside the circumference of the coiled strand. The sockets can be wrapped to protect against mechanical damage during transit. Smaller diameter coils can be stacked and shrink wrapped on enclosed wooden pallets for added protection.

Long length cable assemblies can be transported on individually designed reels. Wooden reels are used for piece weights up to approximately 10 tonnes, thereafter steel reels are used. The fitted sockets are contained within the reel in special compartments. For additional protection from contamination and damage during transit, the cable can be wrapped in polyweave plastic and the outer circumference of the reel can be lagged with timbers.

Transport and storage guidelines

During lifting, always use a minimum of three equidistantly positioned soft slings of sufficient length to avoid deforming the coil. When stacking coils, either during transportation or for storage, always use adequate wood dunnage. Reels are generally lifted by means of a centre shaft. For long term storage of cables, always ensure protection from atmospheric influences but maintain adequate ventilation to avoid the build up of condensation. Avoid direct contact with the floor and ensure there is a flow of air under the strand.

On site handling recommendations

Coiled strands require special care when handling and must be placed on a rotating braked pay-off stand. The cable assembly should then be pulled off horizontally – pulling the cable vertically will create a corkscrew effect and damage the product. For cable assemblies supplied on reels a suitably braked stand should be used.

When handling cable assemblies we recommend the following:

- Observe the cable at all times, do not allow it to kink, twist or be pulled over sharp edges
- Maintain a bend radius of at least 15 times the cable diameter for locked coil and 12 times the cable diameter for spiral strand
- Avoid damaging the zinc coating
- Always remove any seizing wires after installation

Coil

Reel

Transport by road

Transport by air

Erection Engineering

Although the use of steel cable systems is becoming more common for a wide range of structures, the method of construction is not standard. Proper planning of the construction requires a level of knowledge and experience which is not always available within an organisation. Cable structures are unlike other conventional buildings in many cases and special calculation methods including non-linear analysis may be required.

Bridon are able to assist architects, engineers or designers at feasibility stage to check proposals and to advise on construction issues and also provide cost estimates.

During the construction phase, Bridon offer a full supply and installation service which allows the contractor to interact with one party only during this critical stage. The service includes co-ordination between other trades during the erection as well as checking of critical interface dimensions.

Installation

The installation of structural strand needs to be carried out in a manner which is safe and also eliminates the possibility of damaging the strand. Cable assemblies are normally transported either in coils or on reels and special equipment is needed to handle these items on site. Bridon are able to provide braked coiling tables or braked reel stands in order to pay off the cable assemblies in the correct manner. We also provide the skilled labour and all erection equipment necessary to properly install cable assemblies in the structure.

Braked reel stand

Braked coiling table

Tensioning

The tensioning scheme will vary from structure to structure. Restrictions and limitations caused by geometrical or structural considerations make it essential to consult with the erector at an early stage. Bridon use 3-d solid modelling techniques to design tensioning equipment, taking into account the actual dimensions of the structure. This enables us to tailor the tensioning equipment to the structure.

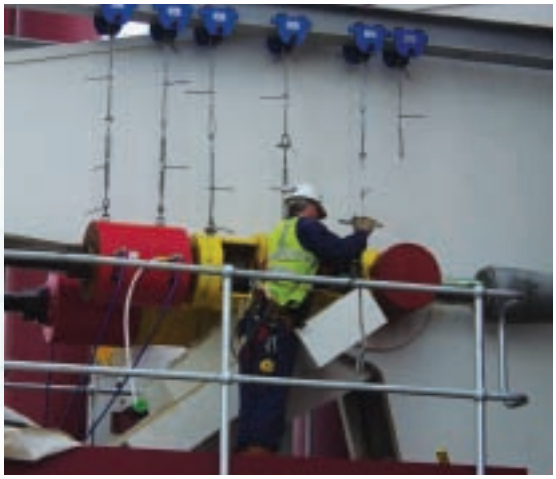
Bridon have a team of experienced technicians on call to carry out the cable tensioning work. This full service includes the provision of all equipment including hydraulic jacks and power packs. We are able to tension cables fitted with all types of end terminations from the Bridon range.

Adjustable Sockets

In many structures it is desirable to allow for length adjustment in the cables and Bridon standard range includes a number of adjustable type sockets. The adjustment is made by transferring the load from the cable into temporary supports using specially designed equipment. Once the load is removed from the cable, the length can be manually altered by the correct amount and the load subsequently returned to the cable.

Typical Tensioning Schemes

ST-C and ST-IC

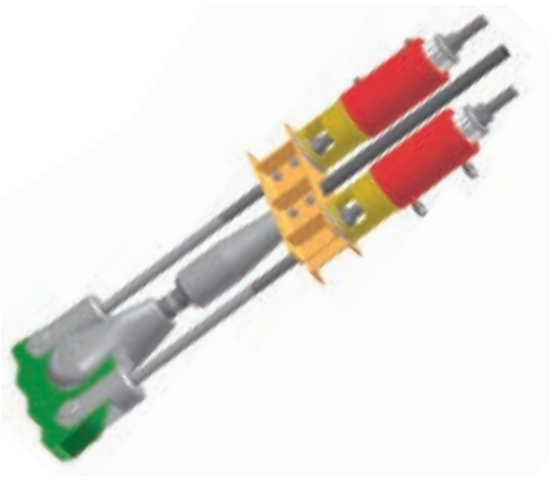


Stylite Conical Socket used to anchor roof support strand.

Typical tensioning scheme

ST-AF

Stylite Adjustable Fork Socket used as deck anchor



Typical tensioning scheme

ST-FA

Stylite Fork Socket Adaptor Bar used as deck anchor

Typical tensioning scheme

ST-B

Stylite Block Socket used as main cable anchor

Typical tensioning scheme

ST-IEC

Stylite Internal/External Thread Cylindrical Socket used to anchor roof catenary strand

Typical tensioning scheme

ST-IEC

Stylite Internal/External Socket with spherical seating

Typical tensioning scheme (with spherical seating)

Cable Inspection

The use of spiral strand and locked coil strand allows for easy inspection during service. The most basic form of inspection is a visual examination of the strand and socket. This can be carried out manually or automatically using remote cameras. Any external corrosion or broken wires can be identified and remedial action carried out.

Main Cable inspection on Tamar Bridge, UK

Actual prestress force in a structure using spiral strand or locked coil strand can also be measured easily using a number of methods.

Strand tension measurement

It is also possible to check the internal condition of the strand. This is usually carried out using NDT techniques. Examples of this include wire break detection using acoustic monitoring and internal corrosion detection using electro-magnetism.

Cable Replacement

In some structures, it may be necessary to replace existing cables. The reason for this could be upgrading of the structure to allow for increased loads or deterioration owing to lack of maintenance. In most instances it is possible design a scheme to remove a cable and replace it with another.

Replacement of hanger cable on suspension bridge

Detensioning of suspension bridge main cable