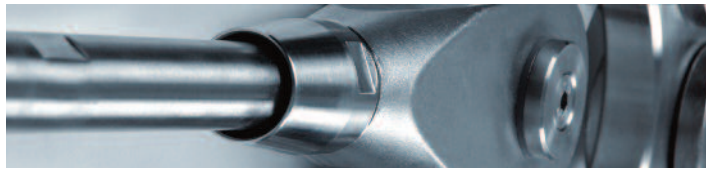


DAVERSTEELS

structural bar systems and steel fabricators



FM12954

Welcome

Daver Steels manufacture high strength structural tie rods with a high specification finish for architectural applications. The DST520 tie rod system is produced in carbon and stainless steel, both with characteristic yield strengths of 520 N/mm².



DAVERSTEELS

structural bar systems and steel fabricators

The DST520 system provides a technical solution to your tie rod requirements. We have a wide range of experience with tie rod systems and can offer assistance to architects, designers and the end user.

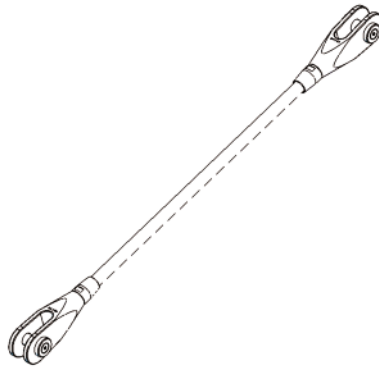


English Institute of Sport - Sheffield

As well as the standard range of fittings shown in this publication Daver Steels are happy to manufacture to your specific needs. Please contact us about your bespoke requirements, for example; special machined forks, spades or couplings, special pins, plate connections, fabricated brackets, welded plate spades.

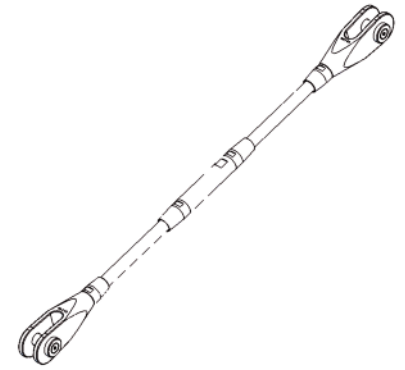
Tie bar arrangements

The options shown here are generic arrangements. Please contact us about bespoke solutions, stainless, carbon steel brackets & glazing fabrications.



Fork to fork

The simplest form of tendon comprises a bar with a left hand and right hand threaded fork at opposite ends. Once installed the tendon can be adjusted in length by turning the bar. See table 3 to ensure that there is sufficient adjustment for the application.



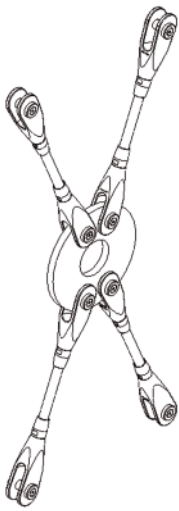
Fork to fork with turnbuckle

Generally for longer length tendons where fork to fork tendons do not give adequate length adjustment or the overall length exceeds the maximum single bar length.

A turnbuckle gives +/- 50mm adjustment for M20 and above.

Where excessive sag in a horizontal bar is anticipated a welded connection cleat can be made to the turnbuckle for hanger and stay bars to be connected.

Longer turnbuckles can also be machined, together with jacking lock covers for applications where the bars need to be stressed after installation. Please contact our sales team for more information.



Central connectors

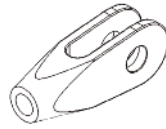
Where tendons cross in a braced bay a central connection disc can be used. Bars and forks are generally threaded left hand/right hand for the central discs. Tendons are usually fork to fork type but where longer adjustments or a pre-tension is required, fork-turnbuckle-fork arrangement can be used.

Fittings

Shown below are the standard range of Daver Steels fittings. Special fittings can be made and supplied upon request.

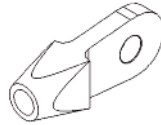
Fork ends

Threaded fork ends are used to terminate bars and transfer load to the structure. Fork ends are cast components from M12 - M100. The forks are threaded left-hand or right-hand depending on the tie rod arrangement and are generally tapped with a blind hole for corrosion detailing.



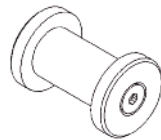
Spade ends

The spade design fits within the fork and matches the load criteria. Spades can be used in place of a fork but the effect of bending and single shear upon the pin must be taken into account. Spades are a special order item.



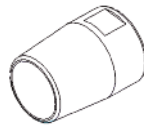
Pins

Standard pins are supplied as a pin barrel with end caps. The end caps are secured with countersunk socket set screws to provide a flush finish. Other pin details can be machined to your specific project requirements.



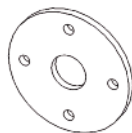
Lockcovers

The locking thread cover (lockcover) is a machined fitting which tapers the fork to the diameter of the bar. For the complete architectural look they also hide exposed threads and when tightened against the fork lock the tendon at the set length. Where thread covers are not required standard hexagonal nuts can be used.



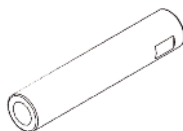
Centre discs

Centre discs are used to connect 3 or 4 tendons together at a central point. Standard centre discs are round with a central hole but other shapes can be made on request. Holes are drilled at an angle to suit your application whether for a braced bay or hanger rods.



Turnbuckles

Turnbuckles are left hand and right hand threaded bar connectors which allow in-situ length adjustments. These are machined with a central chamber to give greater length adjustment than can be achieved with the left-hand/right-hand fork combination.



DST520 system components

The Daver Steels DST520 tie rod system consists of two basic components; high strength round bar and connecting fittings.



Customs post - Switzerland



Details from Watergrass bridge - Eire



Shoreditch Bridge, London

Bar

DST520 bar is a high strength steel ranging in diameters from 12mm to 100mm. Bars are available upto 12m in a single length (longer lengths available on request) and have metric threads applied by cold rolling the thread form onto the bar. Bar is available in both carbon and stainless steel grades

Carbon steel - grade 520

- 520N/mm² yield stress
- a high strength, weldable, structural steel
- available in long lengths (up to 12m) with rolled threads to BS3643
- can be supplied self colour, painted or galvanised

Stainless steel - grade 520

- 520N/mm² 0.2% proof stress
- a high strength cold drawn 316 stainless steel or Duplex stainless steel
- available in lengths up to 7.5m with rolled threads to BS3643
- usually offered as a 'satin' equivalent finish
- bright polished tendons can also be offered

For areas of higher corrosion exposure bright polished stainless steel tendons are recommended.

Table 1 DST520 range of bar diameters and mechanical properties

Grade 520 Carbon steel bar		M12	M16	M20	M24	M30	M36	M42	M48	M56	M64	M76	M90	M100
Yield load (design load)	kN	30	82	127	184	292	425	583	766	1,056	1,392	1,999	2,879	3,605
Nominal bar dia:	mm	12	16	19	22	28	34	39	45	52	60	72	85	97
Maximum single bar length:	m	6	6	12	12	12	12	12	12	12	12	12	12	12

Grade 520 Stainless steel bar		M12	M16	M20	M24	M30	M36	M42	M48	M56
Yield load (design load)	kN	44	82	127	184	292	425	583	677	933
Nominal bar dia:	mm	11	15	18	22	27	33	39	45	52
Maximum single bar length:	m	6	6	7.5	7.5	7.5	7.5	7.5	6	6

All dimensions in mm

for full design details see pages 14-15



M20 - M24 - M42 - M90

Fittings design data

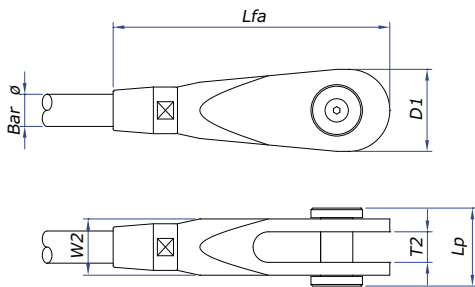
A variety of fittings can be supplied to match your requirements. All fittings are designed to the requirements of BS5950. All fittings exceed the capacity of the bar. Fittings are supplied self colour, painted, galvanised or in stainless steel (satin or bright polished).

Table 2 Fork and spade assembly dimensions

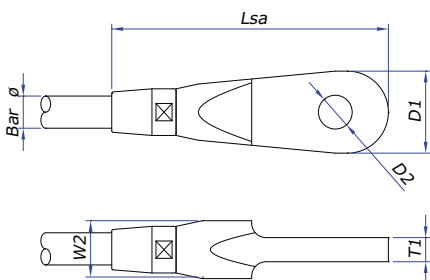
		M12	M16	M20	M24	M30	M36	M42	M48	M56	M64	M76	M90	M100
Nominal bar diameter:		12	16	19	22	28	34	39	45	56	60	72	85	97
Fork assembly length:	Lfa	115	138	172	200	239	272	303	326	388	433	511	624	709
Spade assembly length:	Lsa	115	138	172	200	239	272	303	326	388	458	536	649	734
Thickness:	W2	24	28	35	42	52	64	74	84	95	120	148	170	181
Jaw gap (fork only) +0/-2mm:	T2	14	16	19	24	30	36	39	44	49	59	76	86	91
Spade thickness:	T1	10	12	15	20	25	30	35	40	45	55	70	80	85
Width:	D1	32	43	51	62	79	93	107	121	145	167	199	246	287
Overall pin length:	Lp	34.5	38	48	55	73	84	99	110	120	149	183	213	223

All dimensions in mm

for full design details see pages 14-15



FORK ASSEMBLY



SPADE ASSEMBLY



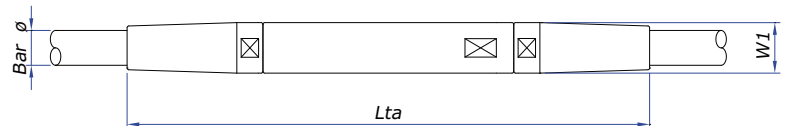
Stainless steel fork with isolated pin

Table 3 Turnbuckles

		M12	M16	M20	M24	M30	M36	M42	M48	M56	M64	M76	M90	M100
Nominal bar diameter:		12	16	19	22	28	34	39	45	52	60	72	85	97
Turnbuckle assembly length:	Lta	130	150	300	322	344	366	398	420	442	464	504	596	635
Diameter:	W1	18	24	29	35	43	52	60	68	80	91	108	129	143
Tendon pin-pin length adjustment														
Fork - fork:	+/- mm	15	15	15	20	20	20	25	25	-	-	-	-	-
Per turnbuckle:	+/- mm	25	25	50	50	50	50	50	50	50	50	50	50	50

All dimensions in mm

for full design details see pages 14-15



TURNBUCKLE ASSEMBLY



Chiswick Park



Madrid airport



Lloyds TSB

Surface finishes

The DST520 tie bar system can be finished to suit specified requirements:



Carbon steel

For carbon steel systems, the options are:

- shot blast and primed; painted piece small and reassembled for site top coat
- galvanised; bar threads are brushed after galvanising in accordance with BS EN 1461 and fitting threads are cut after galvanising to ensure free running. Alternatively, bar threads can be applied after galvanising and cold zinc applied
- galvanised and painted
- self colour

NB: if shot blasting, painting or galvanising is performed by others please ensure that all threads are protected, Daver Steels cannot accept any responsibility for free running of threads once treated by others.

DAVERSTEELS

structural bar systems and steel fabricators

Stainless steel

Stainless steel systems can be offered as:

- satin finish
 - forks - electro polished
 - locking thread covers & pins - fine machined
 - bar - 240 Grit machine finish
- bright polished
 - forks & fittings hand polished to a bright finish
 - bar machined finish to a bright polish

Stainless steel is corrosion resistant. However it is not completely maintenance-free in all environments. For example in coastal, swimming pool and leisure environments stainless steel requires cleaning with a proprietary cleaner to remove light surface corrosion. The time interval between cleaning will be determined by the severity of the exposure.



M20 Stainless steel tie bars

The DST520 stainless steel system should only be used in a chlorine environment after full consideration of the associated risks of stress corrosion cracking.



Where stainless steel fittings are in contact with carbon steel bi-metallic corrosion may take place under certain conditions. To prevent this isolation coatings and washers can be supplied for the pins at request.

[Please contact our technical team for more information.](#)

Site installation

For rapid installation on site, DST520 tendons are pre-assembled in the factory and set to their nominal pin-to-pin length. The tendons are then ready for immediate incorporation into the structure and generally require no site assembly, saving valuable time. To install follow the steps below.



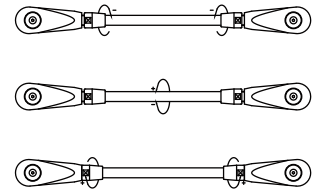
Reebok stadium, Bolton

Fork to fork tendon

1. back off lock covers
2. install tie rods and pins
3. adjust to length - torque to required value if necessary
4. tighten lock covers

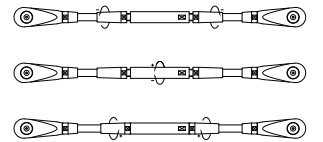
For extra security the pin end caps can be secured using a chemical locking compound (such as 'Loctite') on the counter sunk set screws.

Forks are generally drilled with a blind hole to prevent any run-off from the bars. The lock cover/bar opening can be sealed with a proprietary exterior silicon sealant if required.



Fork to fork tendon with turnbuckle

1. back off turnbuckle locking thread covers
2. install tie rods and pins, tighten fork lock covers
3. adjust tendon length with turnbuckle - torque to required value if necessary
4. tighten turnbuckle lock covers



Tendons longer than 12m will be split into transportable lengths and some site assembly will be required. Ensure all components are fitted to the bar and the nominal pin-to-pin length has been set. Follow the steps indicated above.

DAVERSTEELS

structural bar systems and steel fabricators

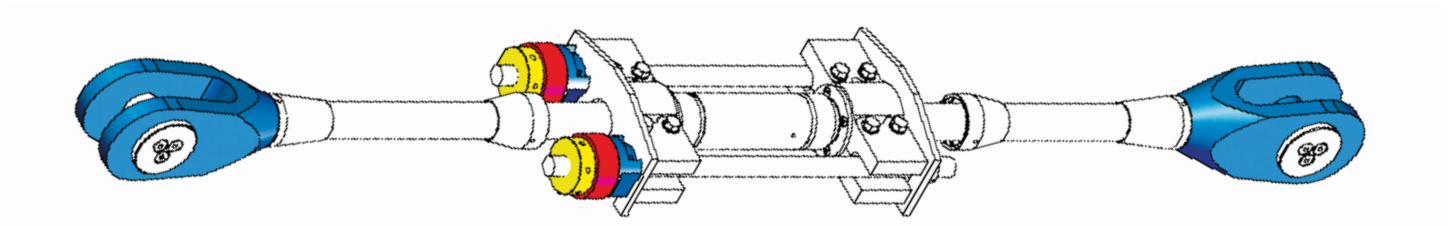
Site pre-stressing

Certain applications may require tendons to be pre-stressed after installation. This can be performed provided jacking turnbuckles have been specified. Daver Steels offer a robust and easy-to-use range of jacking equipment to provide a simple solution to the stressing of tendons which can be performed by most competent steel erectors.

Please contact our sales department for further information.



Daver Steels jacking frame on location



Daver Steels jacking frame

Table 4 DST520 System mechanical properties

Grade 520 Carbon steel bar		M12	M16	M20	M24	M30	M36	M42	M48	M56	M64	M76	M90	M100
Yield load (design load)	kN	30	82	127	184	292	425	583	766	1,056	1,392	1,999	2,879	3,605
Ultimate load (break load):	kN	51	102	159	229	364	531	729	958	1,320	1,739	2,528	3,634	4,547
Nominal bar dia:	mm	12	16	19	22	28	34	39	45	52	60	72	85	97
Stress area:	mm ²	84	157	245	353	561	817	1,121	1,473	2,030	2,676	3,889	5,591	6,995
Yield stress:	N/mm ²	355	520	520	520	520	520	520	520	520	520	520	520	520
Ultimate stress:	N/mm ²	610	650	650	650	650	650	650	650	650	650	650	650	650
Elongation:	%	20	19	19	19	19	19	19	19	19	19	19	19	19
Maximum single bar length:	m	6	6	12	12	12	12	12	12	12	12	12	12	12
Bar specification:	Bar specification: Grade 520 bars to BS EN 10267:1998, fine grained micro alloyed steel with enhanced mechanical properties as detailed M12 bars to BS EN 10025-1, type S355J2. All carbon steel bar is fully weldable.													

Thread specification: Rolled metric threads to BS3643
 Length tolerance: + / - 3mm for M12 to M100

Grade 520 Stainless steel bar		M12	M16	M20	M24	M30	M36	M42	M48	M56
Yield load (design load)	kN	44	82	127	184	292	425	583	677	933
Ultimate load (break load):	kN	55	104	162	233	370	539	740	898	1,238
Nominal bar dia:	mm	11	15	18	22	27	33	39	45	52
Stress area:	mm ²	84	157	245	353	561	817	1,121	1,473	2,030
Yield stress:	N/mm ²	520	520	520	520	520	520	520	460	460
Ultimate stress:	N/mm ²	660	660	660	660	660	660	660	610	610
Maximum single bar length:	m	6	6	7.5	7.5	7.5	7.5	7.5	6	6
Bar specification:	Grade 316 stainless steel, cold drawn bar to BS970 or Duplex stainless steel									
Thread specification:	Rolled metric threads to BS3643									
Length tolerance:	+ / - 3mm for M12 to M56									

Table 5 Fork and spade dimensions

		M12	M16	M20	M24	M30	M36	M42	M48	M56	M64	M76	M90	M100
Yield load (design load)	kN	30	56	112	162	258	375	515	677	933	1,231	1,768	2,547	3,188
Fork length:	Lf	90	112	132	155	189	217	243	266	313	348	420	498	575
Spade length:	Ls	90	112	132	155	189	217	243	266	313	373	445	523	600
Diameter:	W1	18	22	29	35	43	52	60	68	80	91	108	129	143
Thickness:	W2	24	28	35	42	52	64	74	84	95	120	148	170	181
Jaw gap (fork only) +0/-2mm:	T2	14	16	19	24	30	36	39	44	49	59	76	86	91
Spade thickness:	T1	10	12	15	20	22	30	35	40	45	55	70	80	85
Width:	D1	32	43	51	62	79	93	107	121	145	167	199	246	287
Pin hole diameter:	D2	13	17	21	25	31	37	43	50	58	66	78	96	111
Projection:	L1	21	27	33	41	52	61	69	78	96	110	131	161	188
Jaw depth (fork only):	L2	25	30	42	50	59	68	78	87	105	120	141	171	197

All dimensions in mm

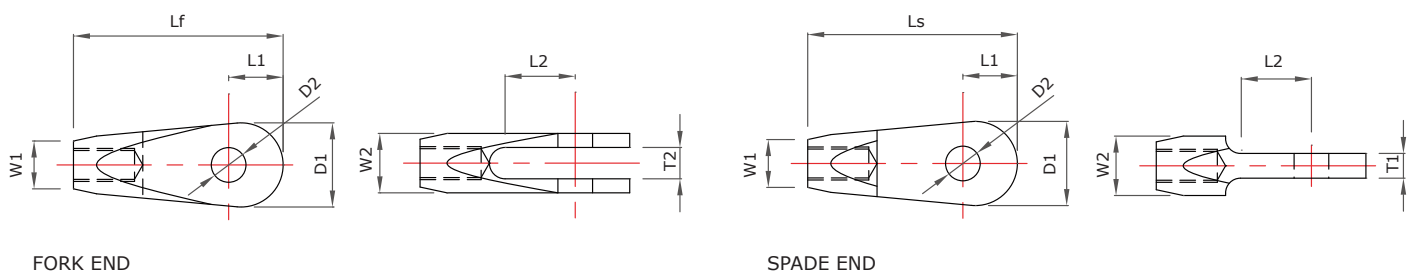


Table 6 Accessories

Connection plates		M12	M16	M20	M24	M30	M36	M42	M48	M56	M64	M76	M90	M100
Thickness:	T1	10	12	15	20	25	30	35	40	45	55	70	80	85
Pin hole diameter:	D2	13	17	21	25	31	37	43	49	57	65	78	96	111
Projection:	L1	21	27	33	41	52	61	69	78	96	110	131	161	188
Clearance:	L3	32	38	52	62	74	87	97	107	125	140	161	196	222
Grade plate to BS EN 10025:		S355	S355	S355	S355	S355	S355	S355	S355	S355	S355	S355	S355	S355

ensure clearance for paint/galvanising

Centre discs		M12	M16	M20	M24	M30	M36	M42	M48	M56
Thickness:	T1	10	12	15	20	25	30	35	40	45
Overall diameter:	OD	145	185	245	285	350	420	490	560	660
Central hole:	ID	50	60	70	90	100	120	140	160	200
Pin hole diameter:	D2	13	17	21	25	31	37	43	49	57
PCD:	PCD	110	140	180	210	260	310	360	410	480
Grade plate to BS EN 10025:		S355	S355	S355	S355	S355	S355	S355	S355	S355

ensure clearance for paint/galvanising

All dimensions in mm

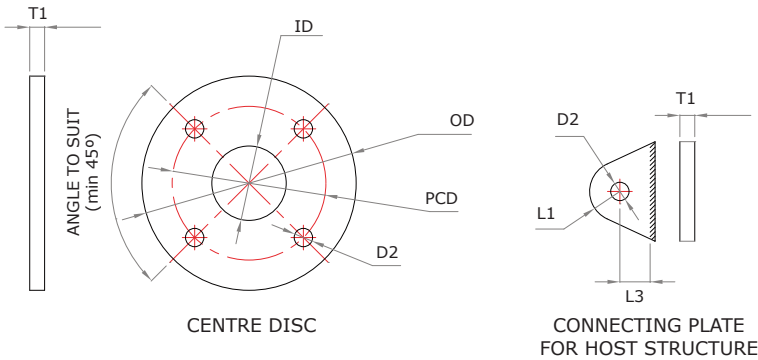
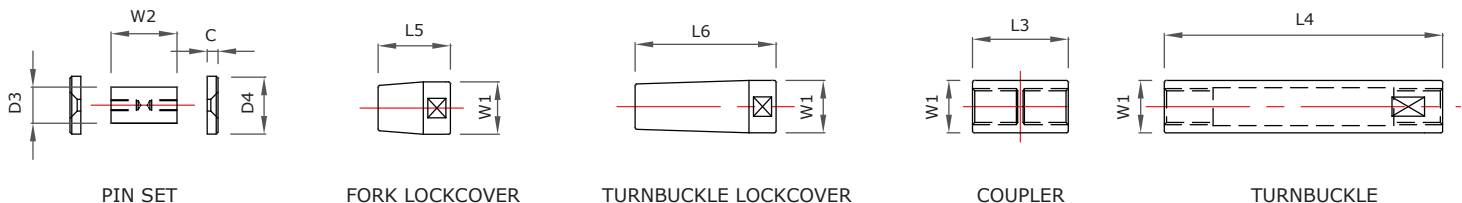


Table 7 Accessories

Pinsets		M12	M16	M20	M24	M30	M36	M42	M48	M56	M64	M76	M90	M100
Pin diameter:	D3	12	16	20	24	30	36	42	48	56	64	76	94	109
Pin body length:	W2	24	28	36	43	53	64	75	86	96	121	153	173	183
End cap diameter:	D4	20	25	32	35	50	55	60	60	70	86	100	120	140
End cap thickness:	C	3	5	6	6	10	10	12	12	12	14	15	20	20
Lock Covers														
Lockcover diameter:	W1	18	24	29	35	43	52	60	68	80	91	108	129	143
Fork lockcover length:	L5	25	26	40	45	50	55	60	60	75	85	91	126	134
Turnbuckle lockcover length:	L6	30	33	78	84	87	93	102	105	106	112	118	153	160
Turnbuckles/Couplers														
Coupler length:	L3	37	45	53	64	75	89	100	115	135	145	165	195	215
Coupler/turnbuckle diameter:	W1	18	24	29	35	43	52	60	68	80	91	108	129	143
Turnbuckle length:	L4	70	85	144	155	170	180	195	210	230	240	268	290	315

All dimensions in mm





© MMXI daversteels limited - all rights reserved

address
Daver Steels Ltd
395 Petre Street
Sheffield
South Yorkshire
S4 8LN
United Kingdom

telephone
+44 (0) 114 261 1999

facsimile
+44 (0) 114 261 1888

e.mail
sales@daversteels.co.uk

website
www.daversteels.co.uk

This data sheet gives the design parameters currently used by Daver Steels Ltd. in the design of its components. The company reserves the right to amend technical details as and when necessary in line with its policy of continuous development.

Design by Loop Print