

Approval body for construction products
and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and
Laender Governments



European Technical Assessment

ETA-15/0917
of 24 July 2019

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General Part

Technical Assessment Body issuing the
European Technical Assessment:

Deutsches Institut für Bautechnik

Trade name of the construction product

FATZER HYEND tension components

Product family
to which the construction product belongs

Prefabricated steel and stainless steel wire ropes with end
connectors

Manufacturer

FATZER AG - Drahtseilwerk
Hofstrasse 44
8590 ROMANSHORN
SCHWEIZ

Manufacturing plant

FATZER AG - Drahtseilwerk
Hofstrasse 44
8590 ROMANSHORN
SCHWEIZ

This European Technical Assessment
contains

44 pages including 40 annexes which form an integral
part of this assessment

This European Technical Assessment is
issued in accordance with Regulation (EU)
No 305/2011, on the basis of

EAD 200001-00-0602

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Specific part

1 Technical description of the product

The construction products are prefabricated high-strength unalloyed galvanized and stainless steel wire ropes with end connectors (sockets) and the trade name "FATZER HYEND tension components".

The prefabricated high-strength wire ropes made of unalloyed galvanized steel consist of full locked coil ropes or spiral strand ropes as well as the sockets. The unalloyed galvanized wire ropes correspond to EN 10264-2:2012, EN 10264-3:2012 as well as to the series of the standards EN 12385¹.

The prefabricated high-strength wire ropes made of stainless steel consist of full locked coil ropes or spiral strand ropes and the sockets. Wire ropes made of stainless steel correspond to EN 10264-4:2012 and EN 10088-3:2014 as well as to the series of the standards EN 12385¹.

In addition to the above-mentioned standards, the unalloyed galvanized and stainless steel wire ropes comply with the specifications in Annex B1.

Types of sockets are listed in Annexes C1 and D1 and are selected according to the application. For the product properties of the components of the sockets, the information in Annex B1 applies.

Drawings of the sockets with its components with the essential dimensions are given in the Annexes C2 to C11 and Annexes D2 to D13.

Dimensions and tolerances not indicated in the Annexes shall correspond to the indications laid down in the technical documentation² to this European Technical Assessment.

2 Specification of the intended use in accordance with the applicable European Assessment Document

The intended use comprises all typical structural applications of high-strength wire ropes made of unalloyed galvanized respectively stainless steel taking into account the national provisions of the Member State applicable for the location where the product is incorporated in the works.

The wire ropes with the sockets are intended for the use in structures with static or quasi-static loads according to EN 1990:2002, where no verification of fatigue relating to EN 1993-1-9:2005 is necessary.

The performances given in Section 3 are only valid if the prefabricated high-strength unalloyed galvanized and stainless steel wire ropes with sockets are used in compliance with the specifications and conditions given in the Annexes.

The verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of the prefabricated high-strength unalloyed galvanized and stainless steel wire ropes with sockets of at least 25 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

With regard to durability the regulations given in EN 1993-1-11:2006, section 4 and EN 1090-2:2018 shall be observed.

For socketing EN 13411-4:2011 applies.

¹ EN 12385-1:2002+A1:2008, EN 12385-2:2002+A1:2008, EN 12385-3:2004+A1:2008 and EN 12385-10:2003+A1:2008
² The technical documentation to this European Technical Assessment is deposited with Deutsches Institut für Bautechnik and, as far as relevant for the tasks of the approved bodies involved in the attestation of conformity procedure is handed over to the approved bodies.

3 Performance of the product and references to the methods used for its assessment

3.1 Mechanical resistance and stability (BWR 1)

Essential characteristic	Performance
Breaking strength	See Annexes B2 to B14
Modulus of deformation / elasticity	See Annex B1

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class A1

The components of the prefabricated unalloyed steel and stainless steel wire ropes with end connectors satisfy the requirements for performance class A1 of the characteristic reaction to fire, in accordance with the provisions of EC decision 96/603/EC (as amended).

4 Assessment and verification of constancy of performance (AVCP) system applied, with reference to its legal base

In accordance with EAD No. 200001-00-0602 the applicable European legal act is: Decision 1998/214/EC.

The system to be applied is: 2+

5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with Deutsches Institut für Bautechnik.

Issued in Berlin on 24 July 2019 by Deutsches Institut für Bautechnik

BD Dipl.-Ing. Andreas Kummerow
Head of Department

beglaubigt:
Bertram

Annex A

A.1 Assumptions concerning design

The design is carried out according to EN 1993-1-11:2006+AC:2009.

The design values of resistance given below are used for design.

The loading is static or quasi-static according to EN 1990:2002 without need of verification of fatigue relating to EN 1993-1-9:2005+AC:2009.

The dimensions, tolerances, material properties and thread engagements ("minL_E") stated in this European Technical Assessment are observed.

The wire ropes with sockets are to be used that no systematic bending occurs in the connecting parts.

The design is carried out by a designer of the structure experienced in the field of steel structures.

The characteristic breaking strength F_{uk} given in the Annexes B2 to B14 for the HYEND ropes applies to the ropes with end connectors. The design tension resistance F_{Rd} shall be calculated with the respective nationally applicable partial safety factors as follows.

Design tension resistance of the wire ropes with end connectors

The design value of the tension resistance F_{Rd} of the wire ropes including the end connectors shall be determined as follows:

$$F_{Rd} = F_{uk} / (1.5 \cdot \gamma_R)$$

Where:

F_{uk} = characteristic value of the breaking strength of the wire ropes according to Annex B2 to B14

(General Remark: $F_{uk} = F_{min} \cdot k_e$

With: F_{min} - minimum breaking force and k_e - loss factor)

$$\gamma_R = 1.0$$

The value given for the partial safety factor γ_R is a minimum value, that means values $\gamma_R < 1.0$ are not allowed. It should be used in cases where no values or no unfavourable values are given in national regulations of the Member State where the wire ropes with sockets are used or in the respective National Annex to Eurocode 3.

The connection components of the supporting structure are not part of the product (ETA) and must be carried out by the designer of the structure. Gusset plates must have a sufficient thickness so that the load bearing capacity of the wire ropes with sockets (in particular the pins) are not impaired.

A.2 Assumptions concerning installation

The installation is carried out such that the wire ropes with sockets are accessible for repair or maintenance at any time.

The installation is only carried out according to the manufacturer's instructions. The manufacturer hands over the assembly instructions to the assembler. From the assembly instructions it is followed that, prior to installation, all components of the wire ropes with end connectors shall be checked for their perfect condition and that damaged components shall not be used.

The responsible assembler attests by notation that all connections with threads were checked concerning the keeping of the minimum thread engagements.

By installing the socket "HYEND Take-Up Spelter Socket" (see Annex D1 and D12) attention is paid on accurate symmetric arrangement of thread bar to avoid eccentric loading of the sleeve.

An uneven distribution of the wire rope force and unfavourable compulsion on the "HYEND Take-Up Spelter Socket" are excluded. When installing the adjustable "HYEND Take-Up Spelter Socket" the two threaded rods are tightened evenly. The difference between the free lengths of the threaded rods in the final state is a maximum of 2 mm.

The conformity of the installed wire ropes with sockets with the provisions of the European Technical Assessment is attested by the executing assembler.

A.3 Indications to the manufacturer

The manufacturer shall ensure that the information on the specific conditions is given to those who are concerned. This information may be given by reproduction of the European Technical Assessment.

In addition all essential installation data shall be shown clearly on the package or on an enclosed instruction sheet, preferably using illustration(s).

To prevent confusion the wire ropes with sockets should be packaged and delivered as a complete unit.

Table 1: Nominal tensile strength and materials of wires

	Galvanised steel		Stainless steel	
	$f_{u,k}$	Material	$f_{u,k}$	Material
Round wire (OSS + FLC)	1770 N/mm ²	to EN 10264-2	1570 N/mm ²	to EN 10264-4 and EN 10088-3
Shaped wire (FLC)	1570 N/mm ²	to EN 10264-3	1570 N/mm ²	to EN 10264-4 and EN 10088-3

Table 2: Materials of sockets

Galvanised steel			Stainless steel		
Number	Name	Standard	Number	Name	Standard
1.0038	S235JR	EN 10025-2	1.4418	X4CrNiMo16-5-1	EN 10088-5
1.0577 ¹⁾	S355J2 ¹⁾	EN 10025-2	1.4462 ¹⁾	X2CrNiMoN22-5-3 ¹⁾	EN 10088-5
1.1118	G24Mn6	EN 10340	1.4468	GX2CrNiMoN25-6-3	EN 10340
1.6582	34CrNiMo6	EN 10083-3	1.4470 ¹⁾	GX2CrNiMoN22-5-3 ¹⁾	EN 10283
		EN 10343 SEW550			
1.6759 ¹⁾	G18NiMoCr3-6 ¹⁾	EN 10340			
1.7225	42CrMo4	EN 10083-3			
		EN 10343 SEW550			
1.7227	42CrMo4S	EN 10083-3 EN 10343 SEW550			
1.7231 ¹⁾	G42CrMo4 ¹⁾	EN 10293			
1.8901	S460N	EN 20025-3			

¹⁾ Material partially with special requirements. Further details are deposited with the DIBt.

Table 3: Modulus of elasticity E_Q

	Galvanised steel	Stainless steel
Spiral Strand Rope (OSS)	160 ±10 kN/mm ²	130 ±10 kN/mm ²
Full Locked Coil Rope (FLC)	160 ±10 kN/mm ²	130 ±10 kN/mm ²

FATZER HYEND tension components

Table 1: Nominal tensile strength and materials of wires
Table 2: Materials of sockets
Table 3: Modulus of elasticity E_Q

Annex B1

Table 4: HYEND Ropes – Spiral Strand Ropes (OSS) – Ø6.0 – Ø35.0 mm

Galvanised steel						Stainless steel					
d ¹⁾ [mm]	F _{min} [kN]	F _{uk} ²⁾ [kN]	F _{Rd} ³⁾ [kN]	F _{uk} ⁴⁾ [kN]	F _{Rd} ⁵⁾ [kN]	d ¹⁾ [mm]	F _{min} [kN]	F _{uk} ²⁾ [kN]	F _{Rd} ³⁾ [kN]	F _{uk} ⁴⁾ [kN]	F _{Rd} ⁵⁾ [kN]
6.0	37.7	33.9	22.6	-	-	6.0	31.8	28.6	19.1	-	-
8.0	67.5	60.7	40.5	-	-	8.0	56.3	50.7	33.8	-	-
10.0	105	94.4	62.9	-	-	10.0	87.7	79.0	52.6	-	-
12.0	150	135	90.3	-	-	12.0	127	114	76.3	-	-
14.0	204	184	123	-	-	14.0	173	155	104	-	-
16.0	266	240	160	-	-	16.0	216	194	129	-	-
18.0	331	298	199	-	-	18.0	276	248	165	-	-
20.0	408	368	245	-	-	20.0	340	306	204	-	-
21.0	450	-	-	450	300	21.0	374	-	-	374	250
21.5	472	-	-	472	315	21.5	392	-	-	392	261
22.0	494	445	297	494	330	22.0	410	369	246	410	273
22.5	518	-	-	518	345	22.5	429	-	-	429	286
23.0	542	-	-	542	361	23.0	449	-	-	449	299
23.5	566	-	-	566	377	23.5	469	-	-	469	313
24.0	591	532	355	591	394	24.0	489	440	294	489	326
24.5	616	-	-	616	411	24.5	510	-	-	510	340
25.0	641	-	-	641	428	25.0	530	-	-	530	353
25.5	667	-	-	667	445	25.5	551	-	-	551	367
26.0	693	624	416	693	462	26.0	572	515	343	572	382
26.5	718	-	-	718	478	26.5	594	-	-	594	396
27.0	742	-	-	742	495	27.0	616	-	-	616	411
27.5	767	-	-	767	511	27.5	639	-	-	639	426
28.0	792	713	475	792	528	28.0	662	596	397	662	441
28.5	820	-	-	820	547	28.5	684	-	-	684	456
29.0	849	-	-	849	566	29.0	707	-	-	707	471
29.5	878	-	-	878	585	29.5	730	-	-	730	486
30.0	907	816	544	907	605	30.0	753	677	452	753	502
30.5	938	-	-	938	625	30.5	778	-	-	778	518
31.0	969	-	-	969	646	31.0	803	-	-	803	535
31.5	1001	-	-	1001	668	31.5	828	-	-	828	552
32.0	1034	931	620	1034	689	32.0	854	769	513	854	570
32.5	1067	-	-	1067	711	32.5	882	-	-	882	588
33.0	1101	-	-	1101	734	33.0	910	-	-	910	607
33.5	1135	-	-	1135	757	33.5	939	-	-	939	626
34.0	1169	1052	702	1169	780	34.0	968	871	581	968	646
34.5	1199	-	-	1199	799	34.5	996	-	-	996	664
35.0	1233	-	-	1233	822	35.0	1025	-	-	1025	683

¹⁾ Nominal rope diameter

²⁾ Swaged sockets, $k_e = 0.9$; ³⁾ Swaged sockets, $k_e = 0.9$, $\gamma_R = 1.0$

⁴⁾ Spelter sockets, $k_e = 1.0$; ⁵⁾ Spelter sockets, $k_e = 1.0$, $\gamma_R = 1.0$

FATZER HYEND tension components

Table 4: HYEND Ropes – Spiral Strand Ropes (OSS) – Ø6.0 – Ø35.0 mm

Annex B2

Table 5: HYEND Ropes – Spiral Strand Ropes (OSS) – Ø35.5 – Ø53.5 mm

Galvanised steel						Stainless steel					
d ¹⁾ [mm]	F _{min} [kN]	F _{uk} ²⁾ [kN]	F _{Rd} ³⁾ [kN]	F _{uk} ⁴⁾ [kN]	F _{Rd} ⁵⁾ [kN]	d ¹⁾ [mm]	F _{min} [kN]	F _{uk} ²⁾ [kN]	F _{Rd} ³⁾ [kN]	F _{uk} ⁴⁾ [kN]	F _{Rd} ⁵⁾ [kN]
35.5	1264	-	-	1264	843	35.5	1054	-	-	1054	703
36.0	1298	1168	779	1298	865	36.0	1083	975	650	1083	722
36.5	1303	-	-	1303	868	36.5	1084	-	-	1084	723
37.0	1306	-	-	1306	871	37.0	1085	-	-	1085	723
37.5	1309	-	-	1309	873	37.5	1085	-	-	1085	724
38.0	1310	-	-	1310	873	38.0	1086	-	-	1086	724
38.5	1344	-	-	1344	896	38.5	1114	-	-	1114	742
39.0	1379	-	-	1379	919	39.0	1142	-	-	1142	761
39.5	1414	-	-	1414	943	39.5	1170	-	-	1170	780
40.0	1450	-	-	1450	967	40.0	1198	-	-	1198	799
40.5	1484	-	-	1484	990	40.5	1229	-	-	1229	819
41.0	1519	-	-	1519	1013	41.0	1259	-	-	1259	839
41.5	1554	-	-	1554	1036	41.5	1290	-	-	1290	860
42.0	1590	-	-	1590	1060	42.0	1321	-	-	1321	881
42.5	1629	-	-	1629	1086	42.5	1353	-	-	1353	902
43.0	1669	-	-	1669	1113	43.0	1385	-	-	1385	923
43.5	1709	-	-	1709	1139	43.5	1417	-	-	1417	945
44.0	1750	-	-	1750	1167	44.0	1450	-	-	1450	967
44.5	1790	-	-	1790	1193	44.5	1483	-	-	1483	989
45.0	1830	-	-	1830	1220	45.0	1517	-	-	1517	1011
45.5	1870	-	-	1870	1247	45.5	1551	-	-	1551	1034
46.0	1910	-	-	1910	1273	46.0	1585	-	-	1585	1057
46.5	1952	-	-	1952	1301	46.5	1620	-	-	1620	1080
47.0	1994	-	-	1994	1329	47.0	1655	-	-	1655	1103
47.5	2037	-	-	2037	1358	47.5	1690	-	-	1690	1127
48.0	2080	-	-	2080	1387	48.0	1726	-	-	1726	1151
48.5	2124	-	-	2124	1416	48.5	1762	-	-	1762	1175
49.0	2169	-	-	2169	1446	49.0	1798	-	-	1798	1199
49.5	2214	-	-	2214	1476	49.5	1835	-	-	1835	1224
50.0	2260	-	-	2260	1507	50.0	1873	-	-	1873	1248
50.5	2305	-	-	2305	1537	50.5	1910	-	-	1910	1274
51.0	2350	-	-	2350	1567	51.0	1948	-	-	1948	1299
51.5	2395	-	-	2395	1597	51.5	1987	-	-	1987	1324
52.0	2440	-	-	2440	1627	52.0	2025	-	-	2025	1350
52.5	2489	-	-	2489	1659	52.5	2065	-	-	2065	1376
53.0	2539	-	-	2539	1693	53.0	2104	-	-	2104	1403
53.5	2589	-	-	2589	1726	53.5	2144	-	-	2144	1429

¹⁾ Nominal rope diameter

²⁾ Swaged sockets, $k_e = 0.9$; ³⁾ Swaged sockets, $k_e = 0.9$, $\gamma_R = 1.0$

⁴⁾ Spelter sockets, $k_e = 1.0$; ⁵⁾ Spelter sockets, $k_e = 1.0$, $\gamma_R = 1.0$

FATZER HYEND tension components

Table 5: HYEND Ropes – Spiral Strand Ropes (OSS) – Ø35.5 – Ø53.5 mm

Annex B3

Table 6: HYEND Ropes – Spiral Strand Ropes (OSS) – Ø54.0 – Ø72.0 mm

Galvanised steel						Stainless steel					
d ¹⁾ [mm]	F _{min} [kN]	F _{uk} ²⁾ [kN]	F _{Rd} ³⁾ [kN]	F _{uk} ⁴⁾ [kN]	F _{Rd} ⁵⁾ [kN]	d ¹⁾ [mm]	F _{min} [kN]	F _{uk} ²⁾ [kN]	F _{Rd} ³⁾ [kN]	F _{uk} ⁴⁾ [kN]	F _{Rd} ⁵⁾ [kN]
54.0	2640	-	-	2640	1760	54.0	2184	-	-	2184	1456
54.5	2689	-	-	2689	1793	54.5	2225	-	-	2225	1483
55.0	2730	-	-	2730	1820	55.0	2266	-	-	2266	1511
55.5	2789	-	-	2789	1860	55.5	2308	-	-	2308	1539
56.0	2840	-	-	2840	1893	56.0	2351	-	-	2351	1567
56.5	2890	-	-	2890	1927	56.5	2394	-	-	2394	1596
57.0	2940	-	-	2940	1960	57.0	2437	-	-	2437	1625
57.5	2990	-	-	2990	1993	57.5	2481	-	-	2481	1654
58.0	3040	-	-	3040	2027	58.0	2525	-	-	2525	1683
58.5	3092	-	-	3092	2061	58.5	2570	-	-	2570	1713
59.0	3144	-	-	3144	2096	59.0	2615	-	-	2615	1743
59.5	3197	-	-	3197	2131	59.5	2660	-	-	2660	1773
60.0	3250	-	-	3250	2167	60.0	2706	-	-	2706	1804
60.5	3307	-	-	3307	2204	60.5	2750	-	-	2750	1834
61.0	3364	-	-	3364	2243	61.0	2795	-	-	2795	1863
61.5	3422	-	-	3422	2281	61.5	2840	-	-	2840	1893
62.0	3480	-	-	3480	2320	62.0	2885	-	-	2885	1924
62.5	3534	-	-	3534	2356	62.5	2931	-	-	2931	1954
63.0	3589	-	-	3589	2393	63.0	2977	-	-	2977	1985
63.5	3644	-	-	3644	2430	63.5	3024	-	-	3024	2016
64.0	3700	-	-	3700	2467	64.0	3070	-	-	3070	2047
64.5	3759	-	-	3759	2506	64.5	3118	-	-	3118	2078
65.0	3810	-	-	3810	2540	65.0	3165	-	-	3165	2110
65.5	3879	-	-	3879	2586	65.5	3215	-	-	3215	2143
66.0	3940	-	-	3940	2627	66.0	3265	-	-	3265	2176
66.5	4000	-	-	4000	2667	66.5	3315	-	-	3315	2210
67.0	4060	-	-	4060	2707	67.0	3366	-	-	3366	2244
67.5	4120	-	-	4120	2747	67.5	3417	-	-	3417	2278
68.0	4180	-	-	4180	2787	68.0	3469	-	-	3469	2313
68.5	4242	-	-	4242	2828	68.5	3521	-	-	3521	2347
69.0	4304	-	-	4304	2869	69.0	3574	-	-	3574	2382
69.5	4367	-	-	4367	2911	69.5	3626	-	-	3626	2418
70.0	4430	-	-	4430	2953	70.0	3680	-	-	3680	2453
70.5	4495	-	-	4495	2997	70.5	3731	-	-	3731	2488
71.0	4560	-	-	4560	3040	71.0	3784	-	-	3784	2522
71.5	4625	-	-	4625	3083	71.5	3836	-	-	3836	2557
72.0	4690	-	-	4690	3127	72.0	3889	-	-	3889	2593

¹⁾ Nominal rope diameter

²⁾ Swaged sockets, $k_e = 0.9$; ³⁾ Swaged sockets, $k_e = 0.9$, $\gamma_R = 1.0$

⁴⁾ Spelter sockets, $k_e = 1.0$; ⁵⁾ Spelter sockets, $k_e = 1.0$, $\gamma_R = 1.0$

FATZER HYEND tension components

Table 6: HYEND Ropes – Spiral Strand Ropes (OSS) – Ø54.0 – Ø72.0 mm

Annex B4

Table 7: HYEND Ropes – Spiral Strand Ropes (OSS) – Ø72.5 – Ø90.5 mm

Galvanised steel						Stainless steel					
d ¹⁾ [mm]	F _{min} [kN]	F _{uk} ²⁾ [kN]	F _{Rd} ³⁾ [kN]	F _{uk} ⁴⁾ [kN]	F _{Rd} ⁵⁾ [kN]	d ¹⁾ [mm]	F _{min} [kN]	F _{uk} ²⁾ [kN]	F _{Rd} ³⁾ [kN]	F _{uk} ⁴⁾ [kN]	F _{Rd} ⁵⁾ [kN]
72.5	4754	-	-	4754	3170	72.5	3942	-	-	3942	2628
73.0	4819	-	-	4819	3213	73.0	3996	-	-	3996	2664
73.5	4884	-	-	4884	3256	73.5	4049	-	-	4049	2700
74.0	4950	-	-	4950	3300	74.0	4104	-	-	4104	2736
74.5	5017	-	-	5017	3345	74.5	4158	-	-	4158	2772
75.0	5080	-	-	5080	3387	75.0	4213	-	-	4213	2809
75.5	5152	-	-	5152	3435	75.5	4270	-	-	4270	2847
76.0	5220	-	-	5220	3480	76.0	4328	-	-	4328	2885
76.5	5290	-	-	5290	3527	76.5	4386	-	-	4386	2924
77.0	5360	-	-	5360	3573	77.0	4444	-	-	4444	2963
77.5	5430	-	-	5430	3620	77.5	4503	-	-	4503	3002
78.0	5500	-	-	5500	3667	78.0	4562	-	-	4562	3042
78.5	5572	-	-	5572	3715	78.5	4622	-	-	4622	3081
79.0	5644	-	-	5644	3763	79.0	4682	-	-	4682	3121
79.5	5717	-	-	5717	3811	79.5	4742	-	-	4742	3162
80.0	5790	-	-	5790	3860	80.0	4803	-	-	4803	3202
80.5	5862	-	-	5862	3908	-	-	-	-	-	-
81.0	5934	-	-	5934	3956	-	-	-	-	-	-
81.5	6007	-	-	6007	4005	-	-	-	-	-	-
82.0	6080	-	-	6080	4053	-	-	-	-	-	-
82.5	6155	-	-	6155	4103	-	-	-	-	-	-
83.0	6230	-	-	6230	4153	-	-	-	-	-	-
83.5	6305	-	-	6305	4203	-	-	-	-	-	-
84.0	6380	-	-	6380	4253	-	-	-	-	-	-
84.5	6457	-	-	6457	4305	-	-	-	-	-	-
85.0	6530	-	-	6530	4353	-	-	-	-	-	-
85.5	6612	-	-	6612	4408	-	-	-	-	-	-
86.0	6690	-	-	6690	4460	-	-	-	-	-	-
86.5	6765	-	-	6765	4510	-	-	-	-	-	-
87.0	6840	-	-	6840	4560	-	-	-	-	-	-
87.5	6920	-	-	6920	4613	-	-	-	-	-	-
88.0	7000	-	-	7000	4667	-	-	-	-	-	-
88.5	7079	-	-	7079	4720	-	-	-	-	-	-
89.0	7159	-	-	7159	4773	-	-	-	-	-	-
89.5	7239	-	-	7239	4826	-	-	-	-	-	-
90.0	7320	-	-	7320	4880	-	-	-	-	-	-
90.5	7402	-	-	7402	4935	-	-	-	-	-	-

¹⁾ Nominal rope diameter

²⁾ Swaged sockets, $k_e = 0.9$; ³⁾ Swaged sockets, $k_e = 0.9$, $\gamma_R = 1.0$

⁴⁾ Spelter sockets, $k_e = 1.0$; ⁵⁾ Spelter sockets, $k_e = 1.0$, $\gamma_R = 1.0$

FATZER HYEND tension components

Table 7: HYEND Ropes – Spiral Strand Ropes (OSS) – Ø72.5 – Ø90.5 mm

Annex B5

Table 8: HYEND Ropes – Spiral Strand Ropes (OSS) – Ø91.0 – Ø109.0 mm

Galvanised steel						Stainless steel					
d ¹⁾ [mm]	F _{min} [kN]	F _{uk} ²⁾ [kN]	F _{Rd} ³⁾ [kN]	F _{uk} ⁴⁾ [kN]	F _{Rd} ⁵⁾ [kN]	d ¹⁾ [mm]	F _{min} [kN]	F _{uk} ²⁾ [kN]	F _{Rd} ³⁾ [kN]	F _{uk} ⁴⁾ [kN]	F _{Rd} ⁵⁾ [kN]
91.0	7484	-	-	7484	4989	-	-	-	-	-	-
91.5	7567	-	-	7567	5045	-	-	-	-	-	-
92.0	7650	-	-	7650	5100	-	-	-	-	-	-
92.5	7734	-	-	7734	5156	-	-	-	-	-	-
93.0	7819	-	-	7819	5213	-	-	-	-	-	-
93.5	7904	-	-	7904	5270	-	-	-	-	-	-
94.0	7990	-	-	7990	5327	-	-	-	-	-	-
94.5	8074	-	-	8074	5383	-	-	-	-	-	-
95.0	8160	-	-	8160	5440	-	-	-	-	-	-
95.5	8244	-	-	8244	5496	-	-	-	-	-	-
96.0	8330	-	-	8330	5553	-	-	-	-	-	-
96.5	8417	-	-	8417	5611	-	-	-	-	-	-
97.0	8504	-	-	8504	5669	-	-	-	-	-	-
97.5	8592	-	-	8592	5728	-	-	-	-	-	-
98.0	8680	-	-	8680	5787	-	-	-	-	-	-
98.5	8769	-	-	8769	5846	-	-	-	-	-	-
99.0	8859	-	-	8859	5906	-	-	-	-	-	-
99.5	8949	-	-	8949	5966	-	-	-	-	-	-
100.0	9040	-	-	9040	6027	-	-	-	-	-	-
100.5	9132	-	-	9132	6088	-	-	-	-	-	-
101.0	9224	-	-	9224	6149	-	-	-	-	-	-
101.5	9317	-	-	9317	6211	-	-	-	-	-	-
102.0	9410	-	-	9410	6273	-	-	-	-	-	-
102.5	9500	-	-	9500	6333	-	-	-	-	-	-
103.0	9590	-	-	9590	6393	-	-	-	-	-	-
103.5	9685	-	-	9685	6457	-	-	-	-	-	-
104.0	9780	-	-	9780	6520	-	-	-	-	-	-
104.5	9884	-	-	9884	6589	-	-	-	-	-	-
105.0	9990	-	-	9990	6660	-	-	-	-	-	-
105.5	10094	-	-	10094	6729	-	-	-	-	-	-
106.0	10200	-	-	10200	6800	-	-	-	-	-	-
106.5	10275	-	-	10275	6850	-	-	-	-	-	-
107.0	10350	-	-	10350	6900	-	-	-	-	-	-
107.5	10425	-	-	10425	6950	-	-	-	-	-	-
108.0	10500	-	-	10500	7000	-	-	-	-	-	-
108.5	10600	-	-	10600	7067	-	-	-	-	-	-
109.0	10700	-	-	10700	7133	-	-	-	-	-	-

¹⁾ Nominal rope diameter

²⁾ Swaged sockets, $k_e = 0.9$; ³⁾ Swaged sockets, $k_e = 0.9$, $\gamma_R = 1.0$

⁴⁾ Spelter sockets, $k_e = 1.0$; ⁵⁾ Spelter sockets, $k_e = 1.0$, $\gamma_R = 1.0$

FATZER HYEND tension components

Table 8: HYEND Ropes – Spiral Strand Ropes (OSS) – Ø91.0 – Ø109.0 mm

Annex B6

Table 9: HYEND Ropes – Spiral Strand Ropes (OSS) – Ø109.5 – Ø127.5 mm

Galvanised steel						Stainless steel					
d ¹⁾ [mm]	F _{min} [kN]	F _{uk} ²⁾ [kN]	F _{Rd} ³⁾ [kN]	F _{uk} ⁴⁾ [kN]	F _{Rd} ⁵⁾ [kN]	d ¹⁾ [mm]	F _{min} [kN]	F _{uk} ²⁾ [kN]	F _{Rd} ³⁾ [kN]	F _{uk} ⁴⁾ [kN]	F _{Rd} ⁵⁾ [kN]
109.5	10800	-	-	10800	7200	-	-	-	-	-	-
110.0	10900	-	-	10900	7267	-	-	-	-	-	-
110.5	10999	-	-	10999	7333	-	-	-	-	-	-
111.0	11099	-	-	11099	7399	-	-	-	-	-	-
111.5	11199	-	-	11199	7466	-	-	-	-	-	-
112.0	11300	-	-	11300	7533	-	-	-	-	-	-
112.5	11399	-	-	11399	7600	-	-	-	-	-	-
113.0	11499	-	-	11499	7666	-	-	-	-	-	-
113.5	11599	-	-	11599	7733	-	-	-	-	-	-
114.0	11700	-	-	11700	7800	-	-	-	-	-	-
114.5	11849	-	-	11849	7900	-	-	-	-	-	-
115.0	12000	-	-	12000	8000	-	-	-	-	-	-
115.5	12100	-	-	12100	8067	-	-	-	-	-	-
116.0	12200	-	-	12200	8133	-	-	-	-	-	-
116.5	12299	-	-	12299	8200	-	-	-	-	-	-
117.0	12399	-	-	12399	8266	-	-	-	-	-	-
117.5	12499	-	-	12499	8333	-	-	-	-	-	-
118.0	12600	-	-	12600	8400	-	-	-	-	-	-
118.5	12700	-	-	12700	8466	-	-	-	-	-	-
119.0	12799	-	-	12799	8533	-	-	-	-	-	-
119.5	12900	-	-	12900	8600	-	-	-	-	-	-
120.0	13000	-	-	13000	8667	-	-	-	-	-	-
120.5	13124	-	-	13124	8749	-	-	-	-	-	-
121.0	13249	-	-	13249	8832	-	-	-	-	-	-
121.5	13374	-	-	13374	8916	-	-	-	-	-	-
122.0	13500	-	-	13500	9000	-	-	-	-	-	-
122.5	13600	-	-	13600	9066	-	-	-	-	-	-
123.0	13699	-	-	13699	9133	-	-	-	-	-	-
123.5	13800	-	-	13800	9200	-	-	-	-	-	-
124.0	13900	-	-	13900	9267	-	-	-	-	-	-
124.5	14024	-	-	14024	9349	-	-	-	-	-	-
125.0	14100	-	-	14100	9400	-	-	-	-	-	-
125.5	14274	-	-	14274	9516	-	-	-	-	-	-
126.0	14400	-	-	14400	9600	-	-	-	-	-	-
126.5	14500	-	-	14500	9666	-	-	-	-	-	-
127.0	14600	-	-	14600	9733	-	-	-	-	-	-
127.5	14700	-	-	14700	9800	-	-	-	-	-	-

¹⁾ Nominal rope diameter

²⁾ Swaged sockets, $k_e = 0.9$; ³⁾ Swaged sockets, $k_e = 0.9$, $\gamma_R = 1.0$

⁴⁾ Spelter sockets, $k_e = 1.0$; ⁵⁾ Spelter sockets, $k_e = 1.0$, $\gamma_R = 1.0$

FATZER HYEND tension components

Table 9: HYEND Ropes – Spiral Strand Ropes (OSS) – Ø109.5 – Ø127.5 mm

Annex B7

Table 10: HYEND Ropes – Spiral Strand Ropes (OSS) – Ø128.0 – Ø135.0 mm

Galvanised steel						Stainless steel					
d ¹⁾ [mm]	F _{min} [kN]	F _{uk} ²⁾ [kN]	F _{Rd} ³⁾ [kN]	F _{uk} ⁴⁾ [kN]	F _{Rd} ⁵⁾ [kN]	d ¹⁾ [mm]	F _{min} [kN]	F _{uk} ²⁾ [kN]	F _{Rd} ³⁾ [kN]	F _{uk} ⁴⁾ [kN]	F _{Rd} ⁵⁾ [kN]
128.0	14800	-	-	14800	9867	-	-	-	-	-	-
128.5	14924	-	-	14924	9949	-	-	-	-	-	-
129.0	15049	-	-	15049	10033	-	-	-	-	-	-
129.5	15174	-	-	15174	10116	-	-	-	-	-	-
130.0	15300	-	-	15300	10200	-	-	-	-	-	-
130.5	15424	-	-	15424	10283	-	-	-	-	-	-
131.0	15549	-	-	15549	10366	-	-	-	-	-	-
131.5	15674	-	-	15674	10449	-	-	-	-	-	-
132.0	15800	-	-	15800	10533	-	-	-	-	-	-
132.5	15900	-	-	15900	10600	-	-	-	-	-	-
133.0	16000	-	-	16000	10666	-	-	-	-	-	-
133.5	16100	-	-	16100	10733	-	-	-	-	-	-
134.0	16200	-	-	16200	10800	-	-	-	-	-	-
134.5	16350	-	-	16350	10900	-	-	-	-	-	-
135.0	16500	-	-	16500	11000	-	-	-	-	-	-

¹⁾ Nominal rope diameter

²⁾ Swaged sockets, $k_e = 0.9$; ³⁾ Swaged sockets, $k_e = 0.9$, $\gamma_R = 1.0$

⁴⁾ Spelter sockets, $k_e = 1.0$; ⁵⁾ Spelter sockets, $k_e = 1.0$, $\gamma_R = 1.0$

FATZER HYEND tension components

Table 10: HYEND Ropes – Spiral Strand Ropes (OSS) – Ø128.0 – Ø135.0 mm

Annex B8

Table 11: HYEND Ropes – Full Locked Coil Ropes (FLC) – Ø25.0 – Ø43.0 mm

Galvanised steel				Stainless steel			
d ¹⁾ [mm]	F _{min} [kN]	F _{uk} ²⁾ [kN]	F _{Rd} ³⁾ [kN]	d ¹⁾ [mm]	F _{min} [kN]	F _{uk} ²⁾ [kN]	F _{Rd} ³⁾ [kN]
25.0	596	596	397	25.0	520	520	347
25.5	620	620	413	25.5	541	541	361
26.0	644	644	429	26.0	562	562	375
26.5	669	669	446	26.5	584	584	389
27.0	695	695	463	27.0	606	606	404
27.5	721	721	481	27.5	629	629	419
28.0	747	747	498	28.0	652	652	435
28.5	774	774	516	28.5	675	675	450
29.0	801	801	534	29.0	699	699	466
29.5	829	829	553	29.5	723	723	482
30.0	858	858	572	30.0	748	748	499
30.5	887	887	591	30.5	773	773	516
31.0	916	916	611	31.0	799	799	533
31.5	946	946	631	31.5	825	825	550
32.0	976	976	651	32.0	852	852	568
32.5	1008	1008	672	32.5	879	879	586
33.0	1040	1040	693	33.0	906	906	604
33.5	1070	1070	713	33.5	934	934	623
34.0	1100	1100	733	34.0	962	962	641
34.5	1135	1135	756	34.5	991	991	661
35.0	1170	1170	780	35.0	1020	1020	680
35.5	1200	1200	800	35.5	1052	1052	701
36.0	1230	1230	820	36.0	1084	1084	723
36.5	1265	1265	843	36.5	1117	1117	744
37.0	1300	1300	867	37.0	1150	1150	767
37.5	1340	1340	893	37.5	1184	1184	789
38.0	1380	1380	920	38.0	1218	1218	812
38.5	1415	1415	943	38.5	1253	1253	836
39.0	1450	1450	967	39.0	1289	1289	859
39.5	1514	1514	1009	39.5	1325	1325	884
40.0	1580	1580	1053	40.0	1362	1362	908
40.5	1620	1620	1080	40.5	1396	1396	931
41.0	1660	1660	1107	41.0	1431	1431	954
41.5	1700	1700	1133	41.5	1467	1467	978
42.0	1740	1740	1160	42.0	1502	1502	1002
42.5	1780	1780	1187	42.5	1539	1539	1026
43.0	1820	1820	1213	43.0	1575	1575	1050

- 1) Nominal rope diameter
 2) Spelter sockets, $k_e = 1.0$
 3) Spelter sockets, $k_e = 1.0$, $\gamma_R = 1.0$

FATZER HYEND tension components

Table 11: HYEND Ropes – Full Locked Coil Ropes (FLC) – Ø25.0 – Ø43.0 mm

Annex B9

Table 12: HYEND Ropes – Full Locked Coil Ropes (FLC) – Ø43.5 – Ø61.5 mm

Galvanised steel				Stainless steel			
d ¹⁾ [mm]	F _{min} [kN]	F _{uk} ²⁾ [kN]	F _{Rd} ³⁾ [kN]	d ¹⁾ [mm]	F _{min} [kN]	F _{uk} ²⁾ [kN]	F _{Rd} ³⁾ [kN]
43.5	1865	1865	1243	43.5	1612	1612	1075
44.0	1910	1910	1273	44.0	1650	1650	1100
44.5	1955	1955	1303	44.5	1688	1688	1125
45.0	2000	2000	1333	45.0	1726	1726	1151
45.5	2045	2045	1363	45.5	1766	1766	1177
46.0	2090	2090	1393	46.0	1806	1806	1204
46.5	2135	2135	1423	46.5	1847	1847	1231
47.0	2180	2180	1453	47.0	1889	1889	1259
47.5	2225	2225	1483	47.5	1930	1930	1287
48.0	2270	2270	1513	48.0	1973	1973	1315
48.5	2320	2320	1546	48.5	2016	2016	1344
49.0	2370	2370	1580	49.0	2059	2059	1373
49.5	2420	2420	1613	49.5	2103	2103	1402
50.0	2470	2470	1647	50.0	2147	2147	1431
50.5	2534	2534	1690	50.5	2190	2190	1460
51.0	2600	2600	1733	51.0	2234	2234	1489
51.5	2650	2650	1767	51.5	2278	2278	1519
52.0	2700	2700	1800	52.0	2322	2322	1548
52.5	2750	2750	1833	52.5	2367	2367	1578
53.0	2800	2800	1867	53.0	2412	2412	1608
53.5	2855	2855	1903	53.5	2458	2458	1639
54.0	2910	2910	1940	54.0	2504	2504	1670
54.5	2965	2965	1976	54.5	2551	2551	1701
55.0	3020	3020	2013	55.0	2598	2598	1732
55.5	3075	3075	2050	55.5	2640	2640	1760
56.0	3130	3130	2087	56.0	2683	2683	1789
56.5	3185	3185	2123	56.5	2726	2726	1817
57.0	3240	3240	2160	57.0	2769	2769	1846
57.5	3300	3300	2200	57.5	2812	2812	1875
58.0	3360	3360	2240	58.0	2856	2856	1904
58.5	3420	3420	2280	58.5	2899	2899	1933
59.0	3480	3480	2320	59.0	2943	2943	1962
59.5	3535	3535	2357	59.5	2988	2988	1992
60.0	3590	3590	2393	60.0	3032	3032	2021
60.5	3650	3650	2433	60.5	3090	3090	2060
61.0	3710	3710	2473	61.0	3148	3148	2099
61.5	3775	3775	2516	61.5	3207	3207	2138

1) Nominal rope diameter

2) Spelter sockets, $k_e = 1.0$

3) Spelter sockets, $k_e = 1.0$, $\gamma_R = 1.0$

FATZER HYEND tension components

Table 12: HYEND Ropes – Full Locked Coil Ropes (FLC) – Ø43.5 – Ø61.5 mm

Annex B10

Table 13: HYEND Ropes – Full Locked Coil Ropes (FLC) – Ø62.0 – Ø80.0 mm

Galvanised steel				Stainless steel			
d ¹⁾ [mm]	F _{min} [kN]	F _{uk} ²⁾ [kN]	F _{Rd} ³⁾ [kN]	d ¹⁾ [mm]	F _{min} [kN]	F _{uk} ²⁾ [kN]	F _{Rd} ³⁾ [kN]
62.0	3840	3840	2560	62.0	3266	3266	2178
62.5	3900	3900	2600	62.5	3327	3327	2218
63.0	3960	3960	2640	63.0	3388	3388	2258
63.5	4025	4025	2683	63.5	3449	3449	2299
64.0	4090	4090	2727	64.0	3511	3511	2341
64.5	4155	4155	2770	64.5	3574	3574	2383
65.0	4220	4220	2813	65.0	3638	3638	2425
65.5	4285	4285	2857	65.5	3690	3690	2460
66.0	4350	4350	2900	66.0	3742	3742	2495
66.5	4415	4415	2943	66.5	3794	3794	2529
67.0	4480	4480	2987	67.0	3847	3847	2565
67.5	4550	4550	3033	67.5	3900	3900	2600
68.0	4620	4620	3080	68.0	3953	3953	2635
68.5	4685	4685	3123	68.5	4007	4007	2671
69.0	4750	4750	3167	69.0	4060	4060	2707
69.5	4820	4820	3213	69.5	4115	4115	2743
70.0	4890	4890	3260	70.0	4169	4169	2779
70.5	4960	4960	3307	70.5	4222	4222	2815
71.0	5030	5030	3353	71.0	4275	4275	2850
71.5	5105	5105	3403	71.5	4328	4328	2886
72.0	5180	5180	3453	72.0	4382	4382	2921
72.5	5250	5250	3500	72.5	4436	4436	2957
73.0	5320	5320	3547	73.0	4490	4490	2993
73.5	5395	5395	3596	73.5	4544	4544	3029
74.0	5470	5470	3647	74.0	4598	4598	3066
74.5	5545	5545	3696	74.5	4653	4653	3102
75.0	5620	5620	3747	75.0	4708	4708	3139
75.5	5695	5695	3797	75.5	4781	4781	3187
76.0	5770	5770	3847	76.0	4855	4855	3236
76.5	5845	5845	3897	76.5	4929	4929	3286
77.0	5920	5920	3947	77.0	5004	5004	3336
77.5	5995	5995	3997	77.5	5080	5080	3387
78.0	6070	6070	4047	78.0	5156	5156	3437
78.5	6150	6150	4100	78.5	5233	5233	3489
79.0	6230	6230	4153	79.0	5311	5311	3541
79.5	6310	6310	4206	79.5	5390	5390	3593
80.0	6390	6390	4260	80.0	5469	5469	3646

1) Nominal rope diameter

2) Spelter sockets, $k_e = 1.0$

3) Spelter sockets, $k_e = 1.0$, $\gamma_R = 1.0$

FATZER HYEND tension components

Table 13: HYEND Ropes – Full Locked Coil Ropes (FLC) – Ø62.0 – Ø80.0 mm

Annex B11

Table 14: HYEND Ropes – Full Locked Coil Ropes (FLC) – Ø80.5 – Ø98.5 mm

Galvanised steel				Stainless steel			
d ¹⁾ [mm]	F _{min} [kN]	F _{uk} ²⁾ [kN]	F _{Rd} ³⁾ [kN]	d ¹⁾ [mm]	F _{min} [kN]	F _{uk} ²⁾ [kN]	F _{Rd} ³⁾ [kN]
80.5	6470	6470	4313	-	-	-	-
81.0	6550	6550	4367	-	-	-	-
81.5	6630	6630	4420	-	-	-	-
82.0	6710	6710	4473	-	-	-	-
82.5	6795	6795	4530	-	-	-	-
83.0	6880	6880	4587	-	-	-	-
83.5	6960	6960	4640	-	-	-	-
84.0	7040	7040	4693	-	-	-	-
84.5	7125	7125	4750	-	-	-	-
85.0	7210	7210	4807	-	-	-	-
85.5	7295	7295	4863	-	-	-	-
86.0	7380	7380	4920	-	-	-	-
86.5	7470	7470	4980	-	-	-	-
87.0	7560	7560	5040	-	-	-	-
87.5	7645	7645	5097	-	-	-	-
88.0	7730	7730	5153	-	-	-	-
88.5	7820	7820	5213	-	-	-	-
89.0	7910	7910	5273	-	-	-	-
89.5	8000	8000	5333	-	-	-	-
90.0	8090	8090	5393	-	-	-	-
90.5	8224	8224	5483	-	-	-	-
91.0	8360	8360	5573	-	-	-	-
91.5	8455	8455	5636	-	-	-	-
92.0	8550	8550	5700	-	-	-	-
92.5	8640	8640	5760	-	-	-	-
93.0	8730	8730	5820	-	-	-	-
93.5	8825	8825	5883	-	-	-	-
94.0	8920	8920	5947	-	-	-	-
94.5	9015	9015	6010	-	-	-	-
95.0	9110	9110	6073	-	-	-	-
95.5	9205	9205	6137	-	-	-	-
96.0	9300	9300	6200	-	-	-	-
96.5	9400	9400	6266	-	-	-	-
97.0	9500	9500	6333	-	-	-	-
97.5	9600	9600	6400	-	-	-	-
98.0	9700	9700	6467	-	-	-	-
98.5	9800	9800	6533	-	-	-	-

1) Nominal rope diameter

2) Spelter sockets, $k_e = 1.0$

3) Spelter sockets, $k_e = 1.0$, $\gamma_R = 1.0$

FATZER HYEND tension components

Table 14: HYEND Ropes – Full Locked Coil Ropes (FLC) – Ø80.5 – Ø98.5 mm

Annex B12

Table 15: HYEND Ropes – Full Locked Coil Ropes (FLC) – Ø99.0 – Ø117.0 mm

Galvanised steel				Stainless steel			
d ¹⁾ [mm]	F _{min} [kN]	F _{uk} ²⁾ [kN]	F _{Rd} ³⁾ [kN]	d ¹⁾ [mm]	F _{min} [kN]	F _{uk} ²⁾ [kN]	F _{Rd} ³⁾ [kN]
99.0	9900	9900	6600	-	-	-	-
99.5	10000	10000	6667	-	-	-	-
100.0	10100	10100	6733	-	-	-	-
100.5	10200	10200	6800	-	-	-	-
101.0	10300	10300	6867	-	-	-	-
101.5	10400	10400	6933	-	-	-	-
102.0	10500	10500	7000	-	-	-	-
102.5	10600	10600	7067	-	-	-	-
103.0	10700	10700	7133	-	-	-	-
103.5	10800	10800	7200	-	-	-	-
104.0	10900	10900	7267	-	-	-	-
104.5	11000	11000	7333	-	-	-	-
105.0	11100	11100	7400	-	-	-	-
105.5	11200	11200	7467	-	-	-	-
106.0	11300	11300	7533	-	-	-	-
106.5	11449	11449	7633	-	-	-	-
107.0	11600	11600	7733	-	-	-	-
107.5	11700	11700	7800	-	-	-	-
108.0	11800	11800	7867	-	-	-	-
108.5	11900	11900	7933	-	-	-	-
109.0	12000	12000	8000	-	-	-	-
109.5	12100	12100	8067	-	-	-	-
110.0	12200	12200	8133	-	-	-	-
110.5	12300	12300	8200	-	-	-	-
111.0	12400	12400	8267	-	-	-	-
111.5	12549	12549	8366	-	-	-	-
112.0	12700	12700	8467	-	-	-	-
112.5	12800	12800	8533	-	-	-	-
113.0	12900	12900	8600	-	-	-	-
113.5	13000	13000	8667	-	-	-	-
114.0	13100	13100	8733	-	-	-	-
114.5	13249	13249	8833	-	-	-	-
115.0	13400	13400	8933	-	-	-	-
115.5	13500	13500	9000	-	-	-	-
116.0	13600	13600	9067	-	-	-	-
116.5	13700	13700	9133	-	-	-	-
117.0	13800	13800	9200	-	-	-	-

- 1) Nominal rope diameter
 2) Spelter sockets, $k_e = 1.0$
 3) Spelter sockets, $k_e = 1.0$, $\gamma_R = 1.0$

FATZER HYEND tension components

Table 15: HYEND Ropes – Full Locked Coil Ropes (FLC) – Ø99.0 – Ø117.0 mm

Annex B13

Table 16: HYEND Ropes – Full Locked Coil Ropes (FLC) – Ø117.5 – Ø135.0 mm

Galvanised steel				Stainless steel			
d ¹⁾ [mm]	F _{min} [kN]	F _{uk} ²⁾ [kN]	F _{Rd} ³⁾ [kN]	d ¹⁾ [mm]	F _{min} [kN]	F _{uk} ²⁾ [kN]	F _{Rd} ³⁾ [kN]
117.5	13949	13949	9300	-	-	-	-
118.0	14100	14100	9400	-	-	-	-
118.5	14200	14200	9467	-	-	-	-
119.0	14300	14300	9533	-	-	-	-
119.5	14400	14400	9600	-	-	-	-
120.0	14500	14500	9667	-	-	-	-
120.5	14650	14650	9766	-	-	-	-
121.0	14800	14800	9867	-	-	-	-
121.5	14900	14900	9933	-	-	-	-
122.0	15000	15000	10000	-	-	-	-
122.5	15150	15150	10100	-	-	-	-
123.0	15300	15300	10200	-	-	-	-
123.5	15400	15400	10267	-	-	-	-
124.0	15500	15500	10333	-	-	-	-
124.5	15650	15650	10433	-	-	-	-
125.0	15800	15800	10533	-	-	-	-
125.5	15844	15844	10563	-	-	-	-
126.0	15887	15887	10591	-	-	-	-
126.5	15929	15929	10619	-	-	-	-
127.0	15970	15970	10647	-	-	-	-
127.5	16011	16011	10674	-	-	-	-
128.0	16050	16050	10700	-	-	-	-
128.5	16089	16089	10726	-	-	-	-
129.0	16127	16127	10751	-	-	-	-
129.5	16164	16164	10776	-	-	-	-
130.0	16200	16200	10800	-	-	-	-
130.5	16300	16300	10867	-	-	-	-
131.0	16400	16400	10933	-	-	-	-
131.5	16550	16550	11033	-	-	-	-
132.0	16700	16700	11133	-	-	-	-
132.5	16800	16800	11200	-	-	-	-
133.0	16900	16900	11267	-	-	-	-
133.5	17050	17050	11366	-	-	-	-
134.0	17200	17200	11467	-	-	-	-
134.5	17300	17300	11533	-	-	-	-
135.0	17400	17400	11600	-	-	-	-

1) Nominal rope diameter


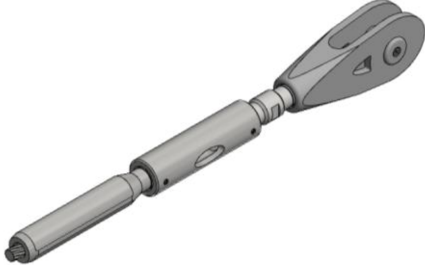

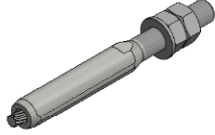
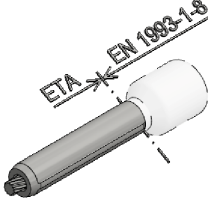
2) Spelter sockets, $k_e = 1.0$

3) Spelter sockets, $k_e = 1.0$, $\gamma_R = 1.0$

FATZER HYEND tension components

Table 16: HYEND Ropes – Full Locked Coil Ropes (FLC) – Ø117.5 – Ø135.0 mm

Annex B14

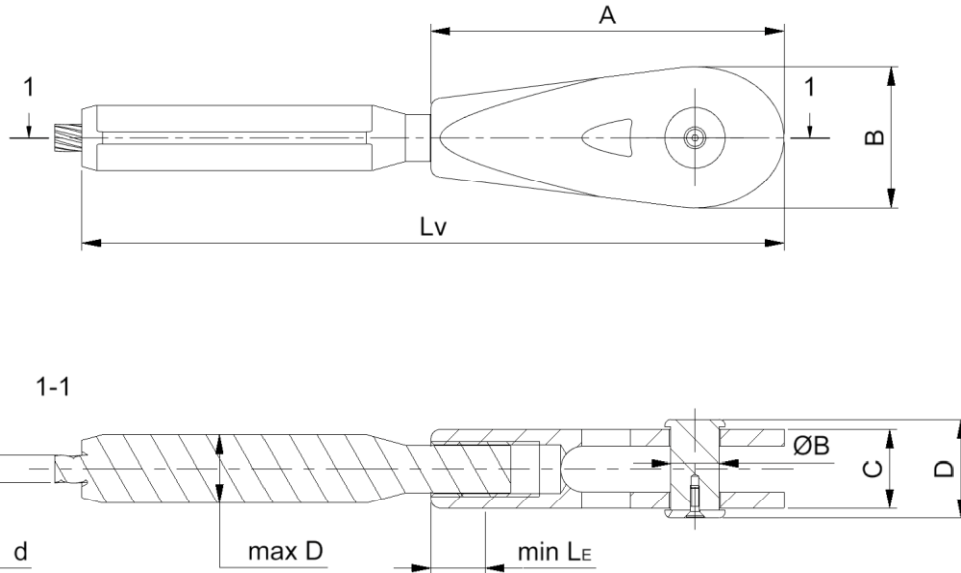
Socket	Material		3D View
	Galvanised steel	Stainless steel	
HYEND Open Socket	Yes	Yes	
HYEND Open Socket with Turnbuckle	Yes	Yes	
HYEND Closed Socket	Yes	Yes	
HYEND Threaded Stud	Yes	Yes	
HYEND Shaft for socket ends to EN 1993-1-8	Yes	Yes	 Examples for socket ends see Appendix C10 and C11 for

electronic copy of the eta by dibt: eta-15/0917

FATZER HYEND tension components

HYEND Swaged Sockets – Overview

Annex C1



d [mm]	$N_{Rd}^{1)}$ [kN]	A [mm]	B [mm]	C [mm]	D [mm]	ØB [mm]	max D ²⁾ [mm]	Lv ³⁾ [mm]	min L _E ⁴⁾ [mm]
6	22.6	99	38	21	31	14	18	185	14
8	40.5	99	38	21	31	14	18	202	14
10	62.9	147	58	33	44	20	26	276	22
12	90.3	147	58	33	44	20	26	293	22
14	123	189	76	44	57	26	34	363	29
16	160	189	76	44	57	26	34	380	29
18	199	234	94	52	65	32	45	465	36
20	245	234	94	52	65	32	45	482	36
22	297	278	111	63	78	39	52	548	44
24	355	278	111	63	78	39	52	565	44
26	416	328	128	74	89	46	59	642	51
28	475	328	128	74	89	46	59	658	51
30	544	364	145	84	103	53	73	727	58
32	620	364	145	84	103	53	73	744	58
34	702	395	158	94	113	60	76	791	64
36	779	395	158	94	113	60	76	808	64

1) Design tension resistance of socket

2) After swaging

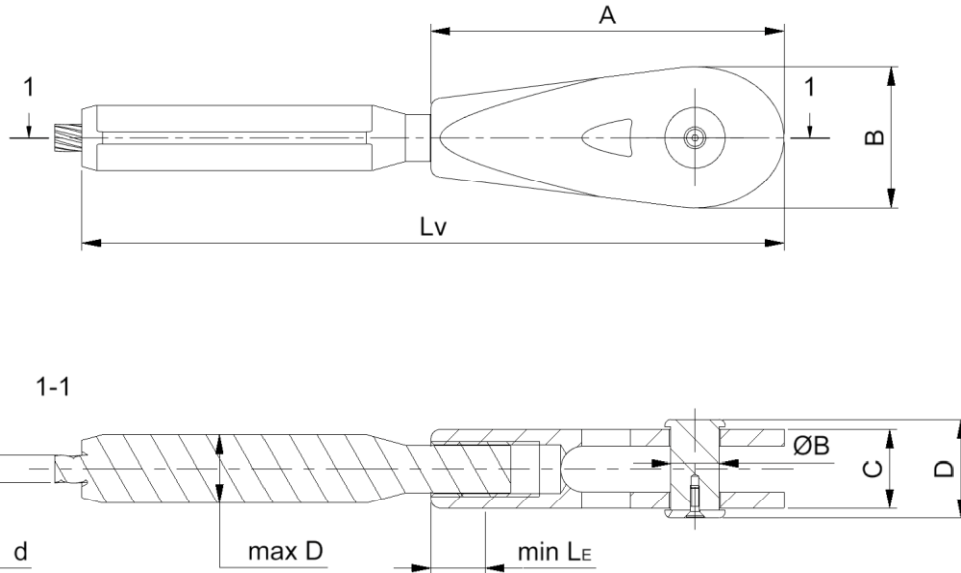
4) Minimum engagement depth of thread

3) After swaging, in zero position

FATZER HYEND tension components

HYEND Open Socket – Swaged – Galvanised steel

Annex C2



d [mm]	$N_{Rd}^{1)}$ [kN]	A [mm]	B [mm]	C [mm]	D [mm]	ØB [mm]	max D ²⁾ [mm]	Lv ³⁾ [mm]	min L _E ⁴⁾ [mm]
6	19.1	99	38	21	31	14	15	177	14
8	33.8	99	38	21	31	14	15	193	14
10	52.6	147	58	33	44	20	23	268	22
12	76.3	147	58	33	44	20	23	284	22
14	104	189	76	44	57	26	31	351	29
16	129	189	76	44	57	26	31	367	29
18	165	234	94	52	65	32	38	444	36
20	204	234	94	52	65	32	38	460	36
22	246	278	111	63	78	39	45	531	42
24	294	278	111	63	78	39	45	547	42
26	343	328	128	74	89	46	52	623	48
28	397	328	128	74	89	46	52	640	48
30	452	364	145	80	99	53	60	701	56
32	513	364	145	80	99	53	60	718	56
34	581	395	158	94	113	60	67	771	61
36	650	395	158	94	113	60	67	787	61

1) Design tension resistance of socket

2) After swaging

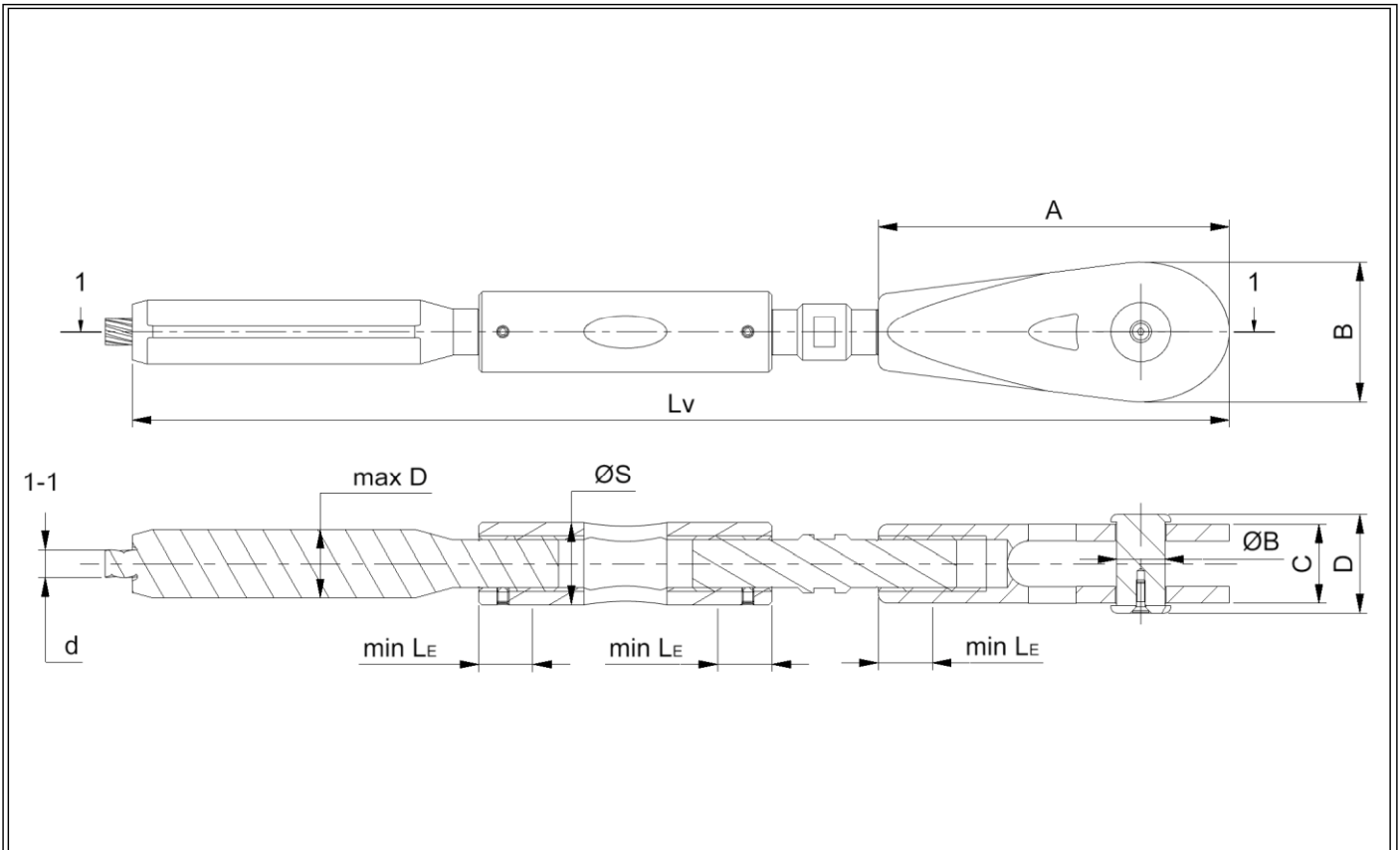
4) Minimum engagement depth of thread

3) After swaging, in zero position

FATZER HYEND tension components

HYEND Open Socket – Swaged – Stainless steel

Annex C3



d [mm]	$N_{Rd}^{1)}$ [kN]	A [mm]	B [mm]	C [mm]	D [mm]	$\varnothing B$ [mm]	max D ²⁾ [mm]	$\varnothing S$ [mm]	$L_v^{3)}$ [mm]	min $L_E^{4)}$ [mm]
6	22.6	99	38	21	31	14	18	23	302	14
8	40.5	99	38	21	31	14	18	23	319	14
10	62.9	147	58	33	44	20	26	34	447	22
12	90.3	147	58	33	44	20	26	34	464	22
14	123	189	76	44	57	26	34	44	580	29
16	160	189	76	44	57	26	34	44	597	29
18	199	234	94	52	65	32	45	54	730	36
20	245	234	94	52	65	32	45	54	747	36
22	297	278	111	63	78	39	52	66	868	44
24	355	278	111	63	78	39	52	66	885	44
26	416	328	128	74	89	46	59	78	1016	51
28	475	328	128	74	89	46	59	78	1032	51
30	544	364	145	84	103	53	73	93	1158	58
32	620	364	145	84	103	53	73	93	1175	58
34	702	395	158	94	113	60	76	104	1276	64
36	779	395	158	94	113	60	76	104	1293	64

1) Design tension resistance of socket

2) After swaging

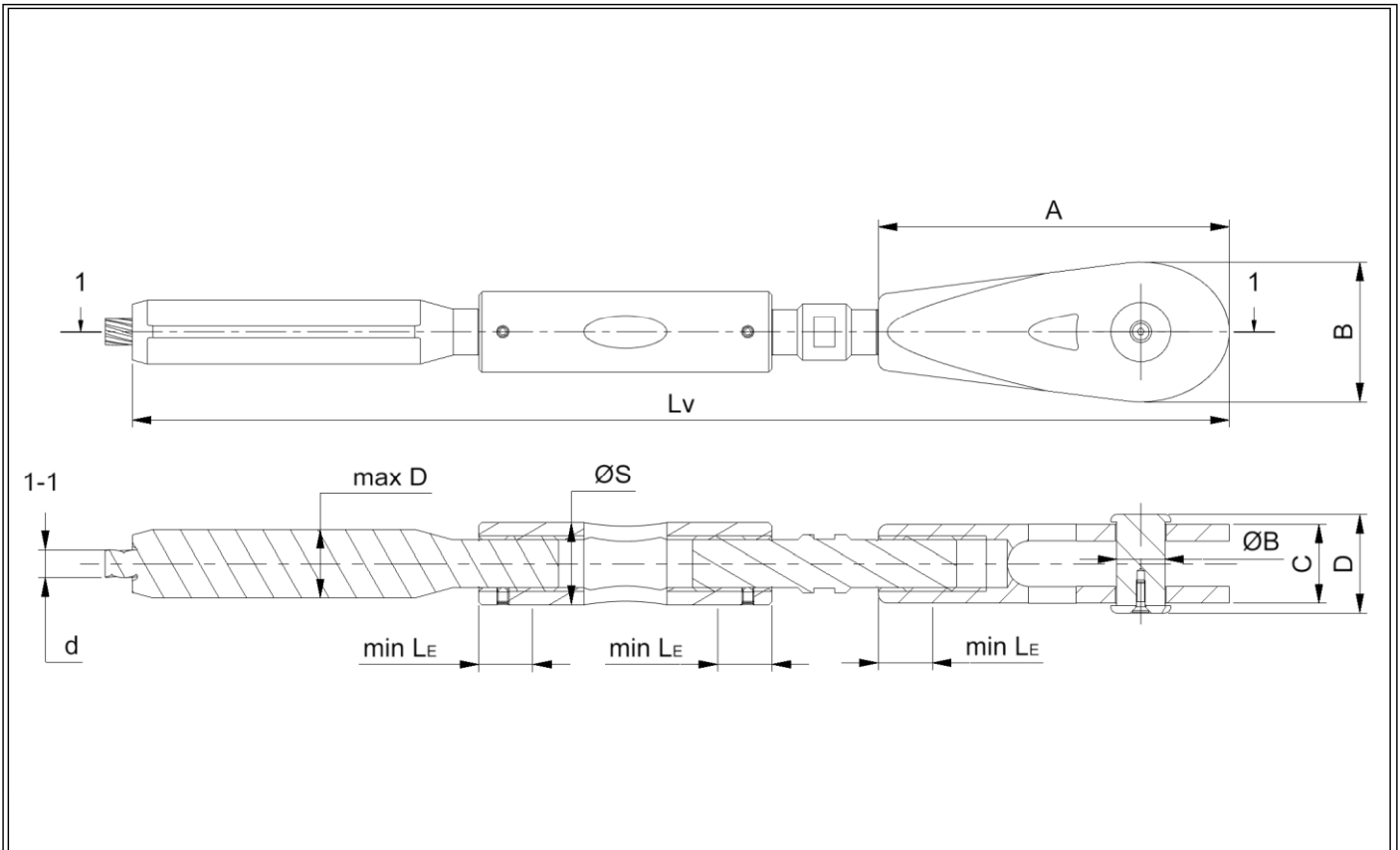
4) Minimum engagement depth of thread

3) After swaging, in zero position

FATZER HYEND tension components

HYEND Open Socket with Turnbuckle – Swaged – Galvanised steel

Annex C4



d [mm]	N _{Rd} ¹⁾ [kN]	A [mm]	B [mm]	C [mm]	D [mm]	ØB [mm]	max D ²⁾ [mm]	ØS [mm]	L _v ³⁾ [mm]	min L _E ⁴⁾ [mm]
6	19.1	99	38	21	31	14	15	23	292	14
8	33.8	99	38	21	31	14	15	23	308	14
10	52.6	147	58	33	44	20	23	30	437	22
12	76.3	147	58	33	44	20	23	30	453	22
14	104	189	76	44	57	26	31	40	568	29
16	129	189	76	44	57	26	31	40	584	29
18	165	234	94	52	65	32	38	48	709	36
20	204	234	94	52	65	32	38	48	725	36
22	246	278	111	63	78	39	45	58	850	44
24	294	278	111	63	78	39	45	58	866	44
26	343	328	128	74	89	46	52	68	996	51
28	397	328	128	74	89	46	52	68	1013	51
30	452	364	145	80	99	53	60	78	1126	58
32	513	364	145	80	99	53	60	78	1143	58
34	581	395	158	94	113	60	67	88	1246	64
36	650	395	158	94	113	60	67	88	1262	64

1) Design tension resistance of socket

2) After swaging

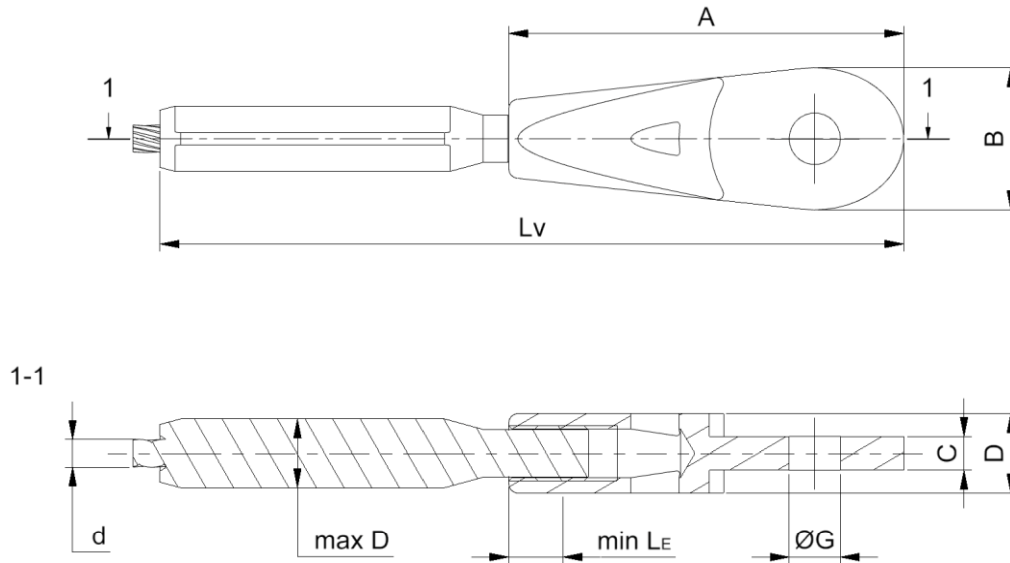
3) After swaging, in zero position

4) Minimum engagement depth of thread

FATZER HYEND tension components

HYEND Open Socket with Turnbuckle – Swaged – Stainless steel

Annex C5



d [mm]	$N_{Rd}^{1)}$ [kN]	A [mm]	B [mm]	C [mm]	D [mm]	$\varnothing G$ [mm]	max D ²⁾ [mm]	$L_v^{3)}$ [mm]	min $L_E^{4)}$ [mm]
6	22.6	111	38	8	21	15	18	197	14
8	40.5	111	38	8	21	15	18	214	14
10	62.9	166	58	13	33	22	26	295	22
12	90.3	166	58	13	33	22	26	312	22
14	123	214	76	18	44	28	34	388	29
16	160	214	76	18	44	28	34	405	29
18	199	262	94	22	52	34	45	493	36
20	245	262	94	22	52	34	45	510	36
22	297	317	111	26	63	41	52	587	44
24	355	317	111	26	63	41	52	604	44
26	416	374	128	31	74	48	59	689	51
28	475	374	128	31	74	48	59	705	51
30	544	417	145	35	84	55	73	780	58
32	620	417	145	35	84	55	73	797	58
34	702	451	158	40	94	62	76	847	64
36	779	451	158	40	94	62	76	864	64

1) Design tension resistance of socket

2) After swaging

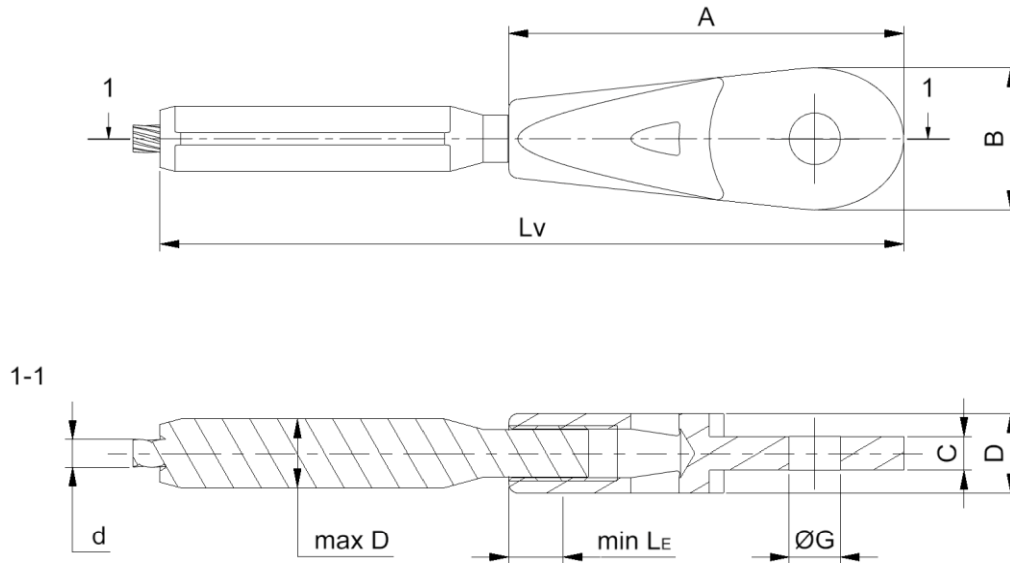
4) Minimum engagement depth of thread

3) After swaging, in zero position

FATZER HYEND tension components

HYEND Closed Socket – Swaged – Galvanised steel

Annex C6



d [mm]	$N_{Rd}^{1)}$ [kN]	A [mm]	B [mm]	C [mm]	D [mm]	$\varnothing G$ [mm]	max D ²⁾ [mm]	Lv ³⁾ [mm]	min L _E ⁴⁾ [mm]
6	19.1	111	38	8	21	15	15	189	14
8	33.8	111	38	8	21	15	15	205	14
10	52.6	166	58	13	33	22	23	287	22
12	76.3	166	58	13	33	22	23	303	22
14	104	214	76	18	44	28	31	376	29
16	129	214	76	18	44	28	31	392	29
18	165	262	94	22	52	34	38	472	36
20	204	262	94	22	52	34	38	488	36
22	246	317	111	26	63	41	45	570	42
24	294	317	111	26	63	41	45	586	42
26	343	374	128	31	74	48	52	670	48
28	397	374	128	31	74	48	52	687	48
30	452	417	145	34	80	55	60	754	56
32	513	417	145	34	80	55	60	771	56
34	581	451	158	40	94	62	67	827	61
36	650	451	158	40	94	62	67	843	61

1) Design tension resistance of socket

2) After swaging.

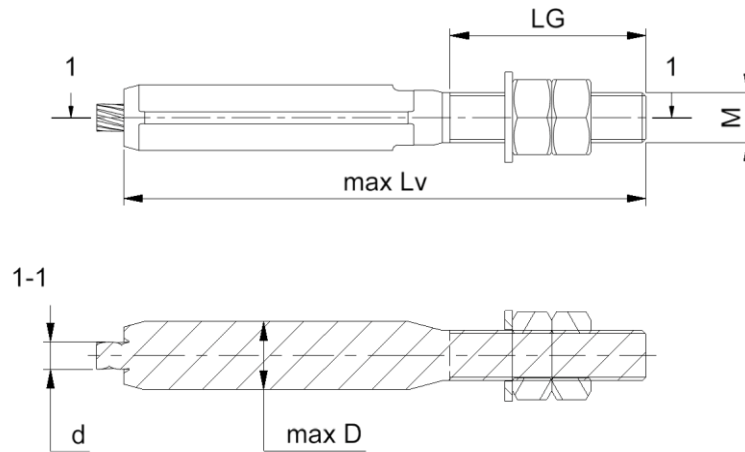
4) Minimum engagement depth of thread

3) After swaging, in zero position

FATZER HYEND tension components

HYEND Closed Socket – Swaged – Stainless steel

Annex C7



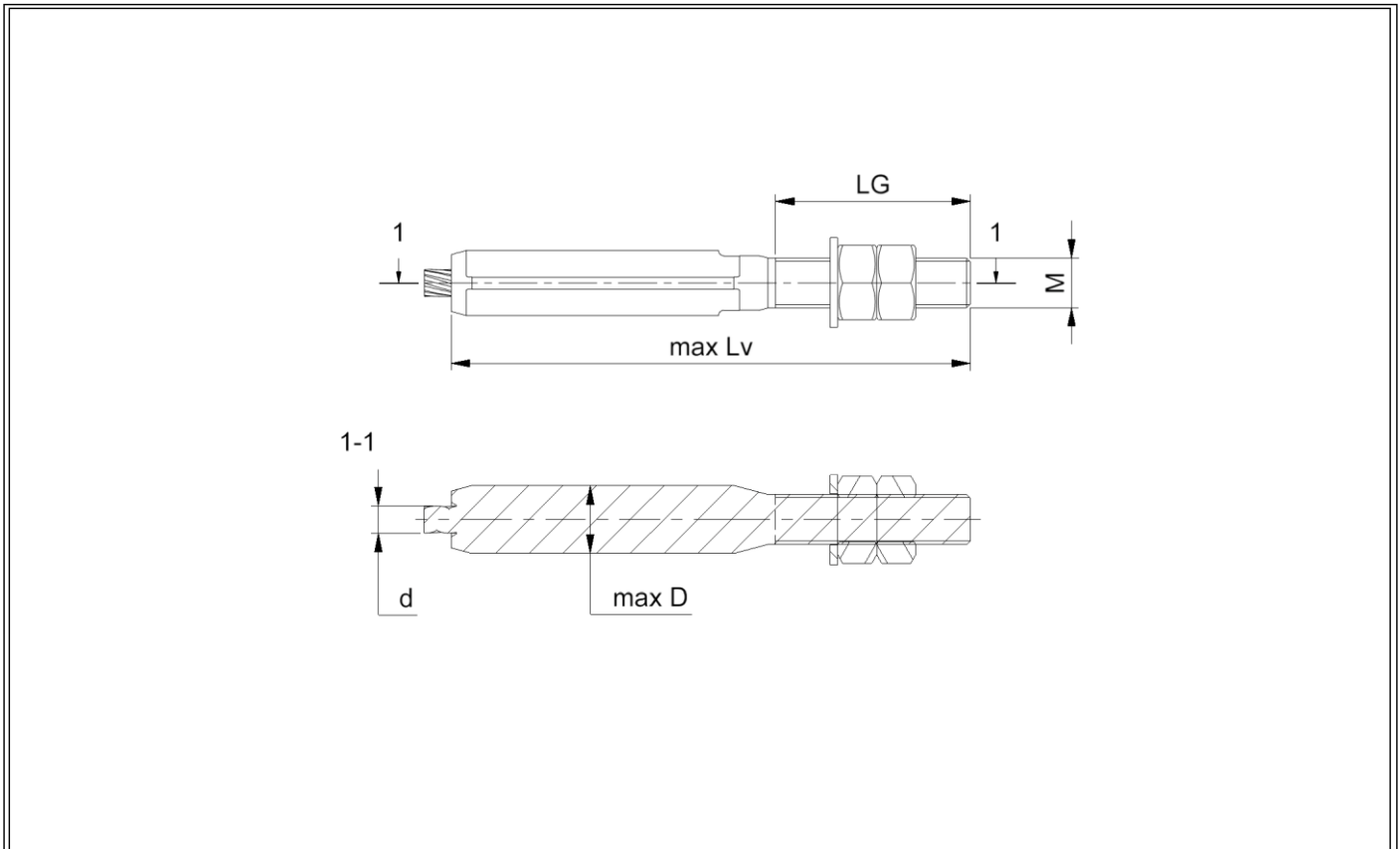
d [mm]	$N_{Rd}^{1)}$ [kN]	LG ²⁾ [mm]	M [mm]	max D ³⁾ [mm]	Lv ³⁾ [mm]
6	22.6	60	M14	18	139
8	40.5	60	M16	18	156
10	62.9	80	M20	26	200
12	90.3	80	M22	26	217
14	123	110	M27	34	272
16	160	110	M30	34	289
18	199	130	M33	45	346
20	245	130	M36	45	363
22	297	160	M39	52	415
24	355	160	M42	52	432
26	416	190	M45	59	487
28	475	190	M48	59	503
30	544	220	M52	73	569
32	620	220	M56	73	586
34	702	250	M60	76	629
36	779	250	M64	76	646

- 1) Design tension resistance of socket
2) Threads of both nuts shall be completely engaged.
3) After swaging

FATZER HYEND tension components

HYEND Threaded Stud – Swaged – Galvanised steel

Annex C8



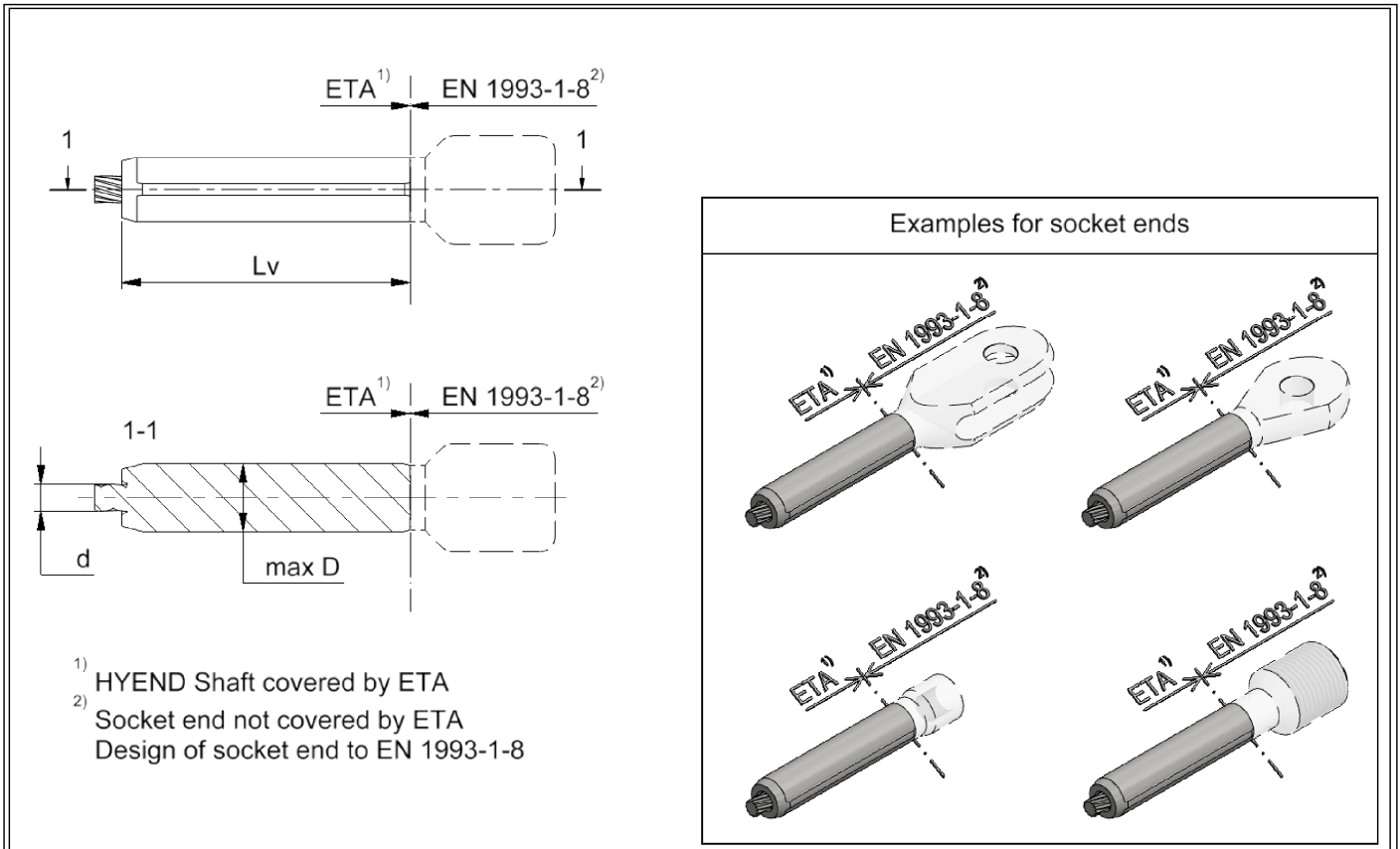
d [mm]	$N_{Rd}^{1)}$ [kN]	LG ²⁾ [mm]	M [mm]	max D ³⁾ [mm]	Lv ³⁾ [mm]
6	19.1	60	M12	15	134
8	33.8	60	M12	15	150
10	52.6	80	M18	23	194
12	76.3	80	M18	23	210
14	104	110	M22	31	270
16	129	110	M22	31	286
18	165	130	M27	38	336
20	204	130	M27	38	352
22	246	160	M33	45	404
24	294	160	M33	45	420
26	343	190	M39	52	472
28	397	190	M39	52	489
30	452	220	M45	60	543
32	513	220	M45	60	560
34	581	250	M48	67	619
36	650	250	M48	67	635

- 1) Design tension resistance of socket
 2) Threads of both nuts shall be completely engaged.
 3) After swaging

FATZER HYEND tension components

HYEND Threaded Stud – Swaged – Stainless steel

Annex C9



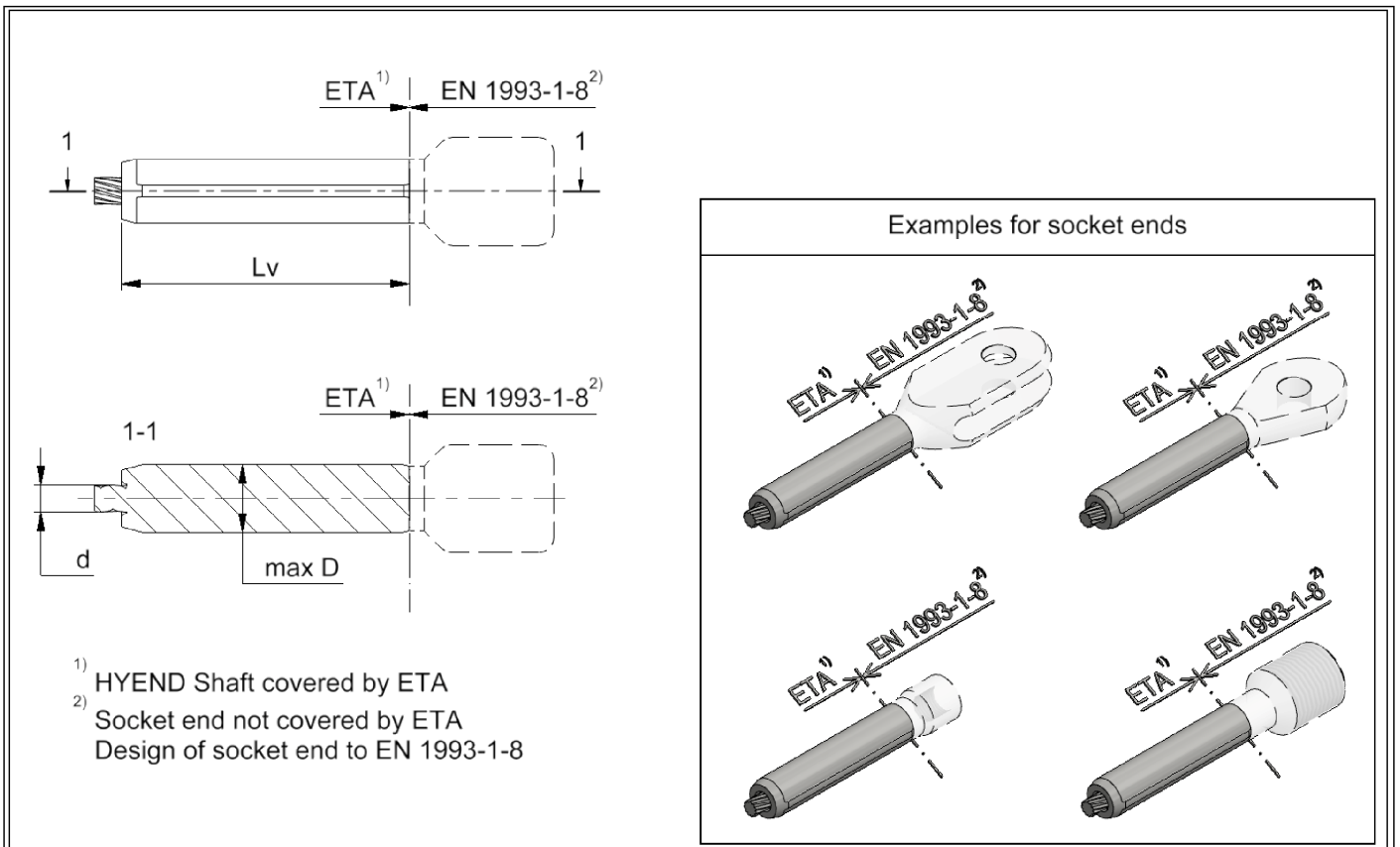
d [mm]	N _{Rd} ³⁾ [kN]	max D ⁴⁾ [mm]	Lv ⁴⁾ [mm]	Socket end
6	22.6	18	71	Socket end is not covered by ETA. Design of socket end to EN 1993-1-8 by user.
8	40.5	18	88	
10	62.9	26	109	
12	90.3	26	126	
14	123	34	146	
16	160	34	163	
18	199	45	192	
20	245	45	209	
22	297	52	229	
24	355	52	246	
26	416	59	268	
28	475	59	284	
30	544	73	307	
32	620	73	324	
34	702	76	344	
36	779	76	361	

³⁾ Design tension resistance of socket
⁴⁾ After swaging

FATZER HYEND tension components

HYEND Shaft for socket ends to EN 1993-1-8 – Swaged – Galvanised steel

Annex C10



d [mm]	N _{Rd} ³⁾ [kN]	max D ⁴⁾ [mm]	Lv ⁴⁾ [mm]	Socket end
6	19.1	15	68	Socket end is not covered by ETA. Design of socket end to EN 1993-1-8 by user.
8	33.8	15	84	
10	52.6	23	105	
12	76.3	23	121	
14	104	31	140	
16	129	31	156	
18	165	38	184	
20	204	38	200	
22	246	45	220	
24	294	45	236	
26	343	52	256	
28	397	52	273	
30	452	60	294	
32	513	60	311	
34	581	67	330	
36	650	67	346	


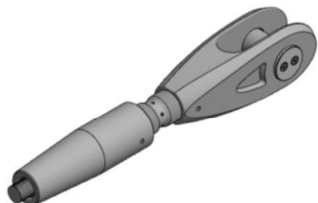
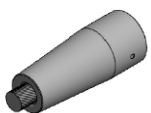
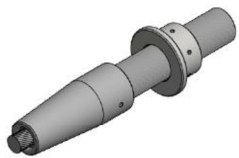

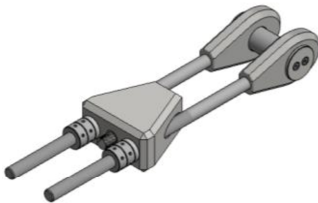

³⁾ Design tension resistance of socket

⁴⁾ After swaging

FATZER HYEND tension components

HYEND Shaft for socket ends to EN 1993-1-8 – Swaged – Stainless steel

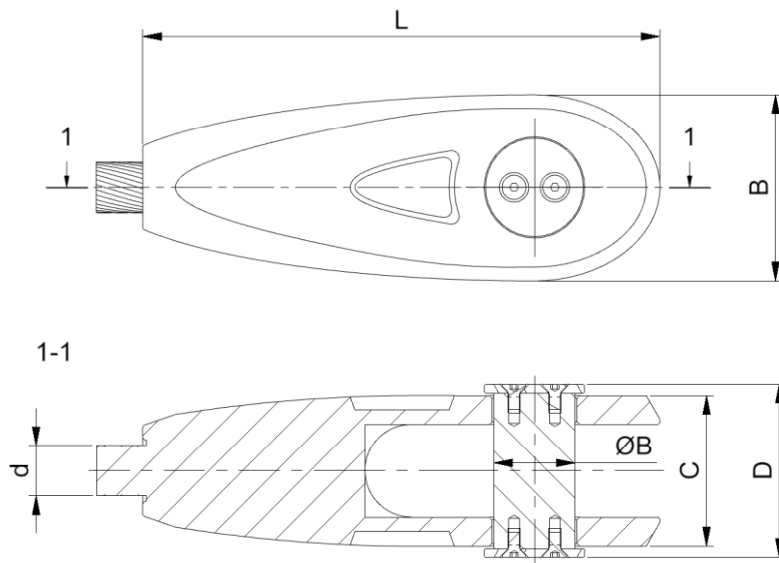
Annex C11

Socket	Material		3D View
	Galvanised Steel	Stainless Steel	
HYEND Open Spelter Socket	Yes	Yes	
HYEND Adjustable Open Spelter Socket	Yes	Yes	
HYEND Conical Spelter Socket	Yes	Yes	
HYEND Conical Spelter Socket with Threaded Bar, Nut and Washer	Yes	Yes	
HYEND Cylindrical Spelter Socket with Internal and External Thread	Yes	Yes	
HYEND Take-Up Spelter Socket	Yes	No	
HYEND Cylindrical Spelter Socket	Yes	No	

FATZER HYEND tension components

HYEND Spelter Sockets – Overview

Annex D1



$d^{1)}$ [mm]	$N_{Rd}^{2)}$ [kN]	L [mm]	B [mm]	C [mm]	D [mm]	$\varnothing B$ [mm]
21 – 25	397	287	100	82	100	45
26 – 31	611	312	111	90	108	49
31 – 35	780	363	129	105	123	56
36 – 40	1053	412	148	120	138	65
41 – 45	1333	458	166	133	153	73
46 – 50	1647	518	186	149	171	83
51 – 55	2013	574	203	168	192	88
56 – 60	2393	635	224	187	211	100
61 – 65	2813	698	244	204	228	107
66 – 70	3260	763	268	223	247	117
71 – 75	3747	828	292	242	268	128
76 – 80	4260	884	313	261	287	137
81 – 85	4807	940	334	279	305	145
86 – 90	5393	996	354	297	325	154
91 – 95	6073	1053	375	315	343	162
96 – 100	6733	1110	395	333	361	171
101 – 105	7400	1168	414	345	373	180
106 – 110	8133	1228	434	355	383	189
111 – 115	8933	1286	455	365	399	200
116 – 120	9667	1344	476	380	414	210
121 – 125	10533	1401	496	390	426	220
126 – 130	10800	1460	517	410	446	230
131 – 135	11600	1521	537	430	466	240

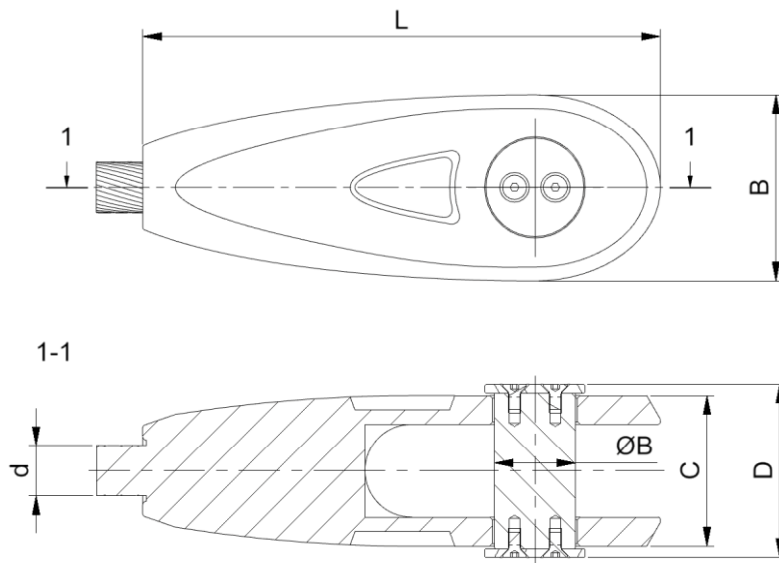
1) Range of applicable nominal rope diameters

2) Design tension resistance of socket

FATZER HYEND tension components

HYEND Open Spelter Socket – Galvanised steel

Annex D2



$d^{1)}$ [mm]	$N_{Rd}^{2)}$ [kN]	L [mm]	B [mm]	C [mm]	D [mm]	$\varnothing B$ [mm]
21 – 25	347	300	105	90	108	48
26 – 30	499	326	116	99	117	56
31 – 35	680	380	135	115	135	61
36 – 40	908	432	155	132	154	71
41 – 45	1151	480	174	146	170	80
46 – 50	1431	543	195	163	189	91
51 – 55	1732	603	213	184	212	97
56 – 60	2021	666	235	205	237	110
61 – 65	2425	732	256	224	258	118
66 – 70	2779	800	281	245	281	129
71 – 75	3139	868	306	266	304	141
76 – 80	3646	928	330	287	329	151

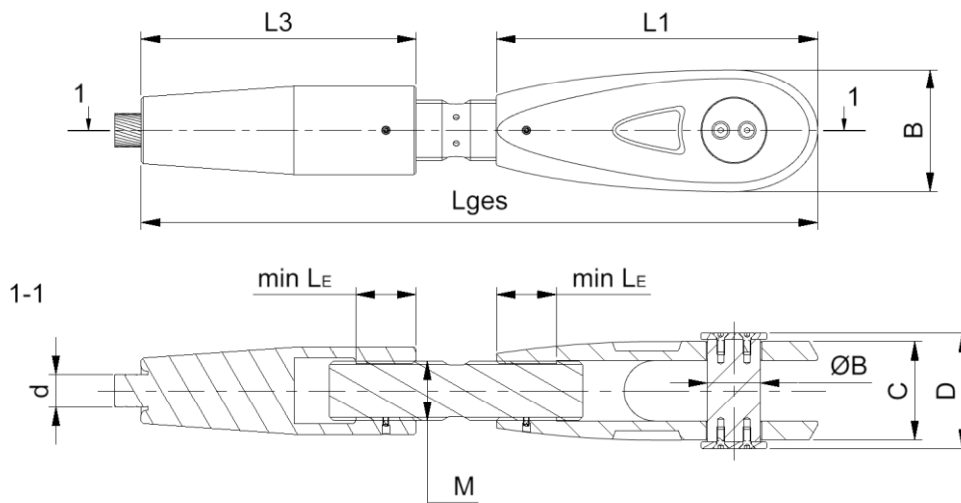
1) Range of applicable nominal rope diameters

2) Design tension resistance of socket

FATZER HYEND tension components

HYEND Open Spelter Socket– Stainless steel

Annex D3



d ¹⁾ [mm]	N _{Rd} ²⁾ [kN]	L1 [mm]	B [mm]	C [mm]	D [mm]	ØB [mm]	L3 [mm]	Lges ³⁾ [mm]	M [mm]	min L _E ⁴⁾ [mm]
21 – 25	397	273	100	82	100	45	215	563	M45	45
26 – 31	611	290	111	90	108	49	248	618	M52	52
31 – 35	780	341	129	105	123	56	291	717	M64	64
36 – 40	1053	387	148	120	138	65	325	812	M72	72
41 – 45	1333	431	166	133	153	73	359	895	M80	80
46 – 50	1647	488	186	149	171	83	395	993	M90	90
51 – 55	2013	542	203	168	192	88	426	1093	M95	95
56 – 60	2393	601	224	187	211	100	462	1193	M105	105
61 – 65	2813	660	244	204	228	107	503	1298	M115	115
66 – 70	3260	722	268	223	247	117	539	1411	M125	125
71 – 75	3747	783	292	242	268	128	580	1523	M135	135
76 – 80	4260	836	313	261	287	137	626	1632	M150	150
81 – 85	4807	889	334	279	305	145	672	1751	M160	160
86 – 90	5393	942	354	297	325	154	713	1855	M170	170
91 – 95	6073	997	375	315	343	162	754	1961	M180	180
96 – 100	6733	1052	395	333	361	171	795	2077	M190	190
101 – 105	7400	1108	414	345	373	180	841	2189	M200	200
106 – 110	8133	1163	434	355	383	189	882	2295	M210	210
111 – 115	8933	1219	455	365	399	200	923	2412	M220	220
116 – 120	9667	1274	476	380	414	210	964	2518	M230	230
121 – 125	10533	1328	496	390	426	220	1010	2628	M240	240
126 – 130	10800	1385	517	410	446	230	1051	2746	M250	250
131 – 135	11600	1409	537	430	466	240	1092	2821	M260	260

1) Range of applicable nominal rope diameters

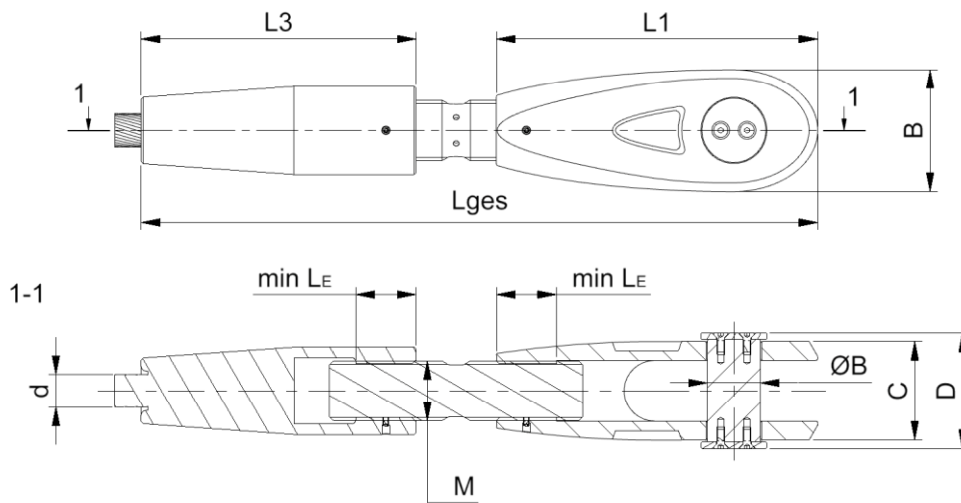
2) Design tension resistance of socket

3) In zero position 4) Minimum engagement depth of threaded bar (coupler bar)

FATZER HYEND tension components

HYEND Adjustable Open Spelter Socket – Galvanised steel

Annex D4



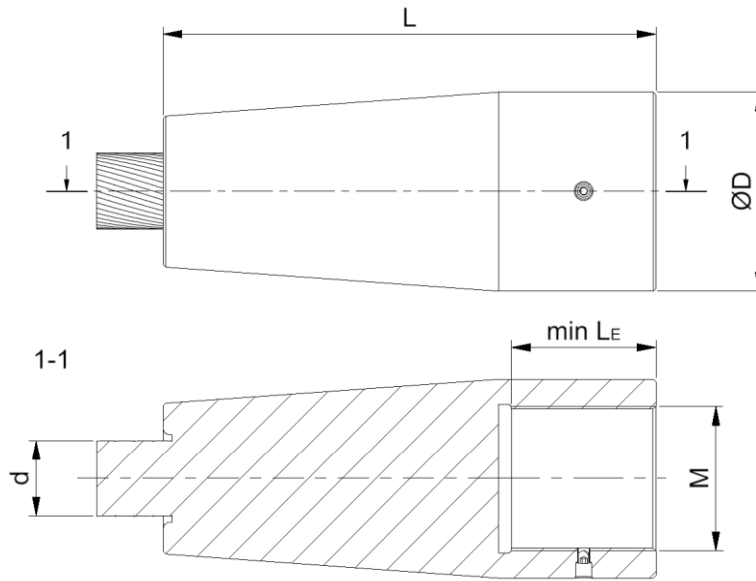
$d^{1)}$ [mm]	$N_{Rd}^{2)}$ [kN]	$L1$ [mm]	B [mm]	C [mm]	D [mm]	$\varnothing B$ [mm]	$L3$ [mm]	$Lges^{3)}$ [mm]	M [mm]	$min L_E^{4)}$ [mm]
21 – 25	347	288	105	90	108	48	215	578	M45	45
26 – 30	499	308	116	99	117	56	248	636	M52	52
31 – 35	680	358	135	115	135	61	291	734	M64	64
36 – 40	908	407	155	132	154	71	325	832	M72	72
41 – 45	1151	453	174	146	170	80	359	917	M80	80
46 – 50	1431	513	195	163	189	91	395	1018	M90	90
51 – 55	1732	570	213	184	212	97	426	1121	M95	95
56 – 60	2021	630	235	205	237	110	462	1222	M105	105
61 – 65	2425	693	256	224	258	118	503	1331	M115	115
66 – 70	2779	757	281	245	281	129	539	1446	M125	125
71 – 75	3139	822	306	266	304	141	580	1562	M135	135
76 – 80	3646	878	330	287	329	151	621	1669	M145	145

- 1) Range of applicable nominal rope diameters
 2) Design tension resistance of socket
 3) In zero position
 4) Minimum engagement depth of threaded bar (coupler bar)

FATZER HYEND tension components

HYEND Adjustable Open Spelter Socket – Stainless steel

Annex D5



$d^{1)}$ [mm]	$N_{Rd}^{2)}$ [kN]	L [mm]	ØD [mm]	M [mm]	min L_E [mm]
21 – 25	397	175	67	M50	Minimum engagement depth of threaded bar. Threaded bar not covered by ETA. Design of threaded bar to EN 1993-1-8 by user.
26 – 31	611	206	83	M60	
31 – 35	780	242	93	M70	
36 – 40	1053	269	108	M76	
41 – 45	1333	299	118	M85	
46 – 50	1647	330	138	M95	
51 – 55	2013	361	148	M105	
56 – 60	2393	392	158	M115	
61 – 65	2813	428	178	M125	
66 – 70	3260	459	188	M135	
71 – 75	3747	490	208	M145	
76 – 80	4260	516	218	M150	
81 – 85	4807	552	228	M160	
86 – 90	5393	583	238	M170	
91 – 95	6073	614	278	M180	
96 – 100	6733	645	288	M190	
101 – 105	7400	681	298	M200	
106 – 110	8133	712	308	M210	
111 – 115	8933	743	318	M220	
116 – 120	9667	774	328	M230	
121 – 125	10533	810	348	M240	
126 – 130	10800	841	358	M250	
131 – 135	11600	872	368	M260	

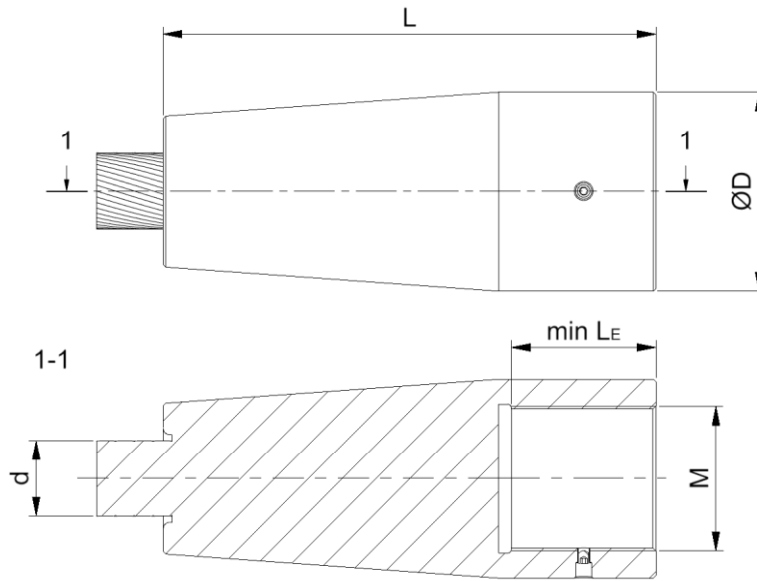
1) Range of applicable nominal rope diameters

2) Design tension resistance of socket

FATZER HYEND tension components

HYEND Conical Spelter Socket – Galvanised steel

Annex D6



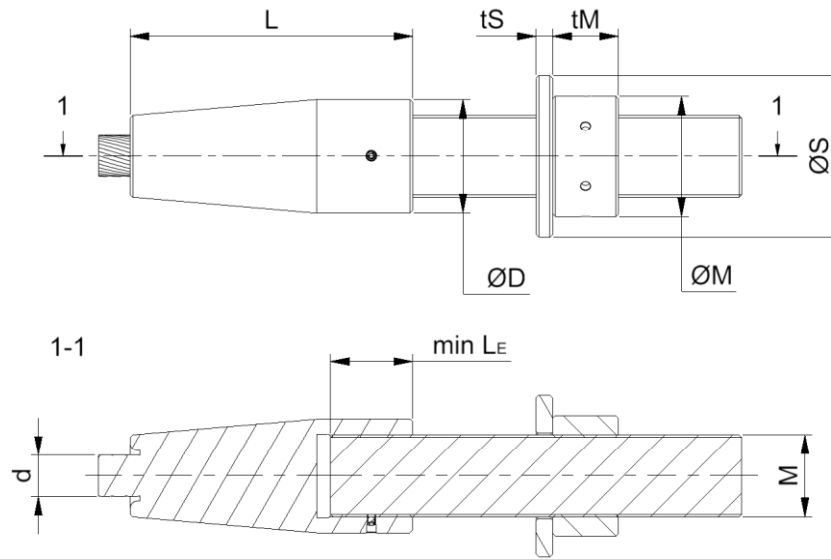
$d^{1)}$ [mm]	$N_{Rd}^{2)}$ [kN]	L [mm]	ØD [mm]	M [mm]	min L_E [mm]
21 – 25	347	170	68	M45	Minimum engagement depth of threaded bar. Threaded bar not covered by ETA. Design of threaded bar to EN 1993-1-8 by user.
26 – 30	499	198	88	M52	
31 – 35	680	236	98	M64	
36 – 40	908	265	113	M72	
41 – 45	1151	294	128	M80	
46 – 50	1431	325	143	M90	
51 – 55	1732	351	158	M95	
56 – 60	2021	382	173	M105	
61 – 65	2425	418	188	M115	
66 – 70	2779	449	203	M125	
71 – 75	3139	480	218	M135	
76 – 80	3646	511	233	M145	

- 1) Range of applicable nominal rope diameters
2) Design tension resistance of socket

FATZER HYEND tension components

HYEND Conical Spelter Socket – Stainless steel

Annex D7



$d^{1)}$ [mm]	$N_{Rd}^{2)}$ [kN]	L [mm]	tS [mm]	tM ³⁾ [mm]	ØS [mm]	ØD [mm]	ØM [mm]	M [mm]	min L _E ⁴⁾ [mm]
21 – 25	397	175	10	40	98	67	73	M50	50
26 – 31	611	206	12	48	118	83	88	M60	60
31 – 35	780	242	14	56	138	93	103	M70	70
36 – 40	1053	269	16	61	153	108	113	M76	76
41 – 45	1333	299	17	68	168	118	128	M85	85
46 – 50	1647	330	19	76	188	138	143	M95	95
51 – 55	2013	361	21	84	208	148	158	M105	105
56 – 60	2393	392	23	92	228	158	173	M115	115
61 – 65	2813	428	25	100	248	178	188	M125	125
66 – 70	3260	459	27	108	268	188	203	M135	135
71 – 75	3747	490	29	116	288	208	218	M145	145
76 – 80	4260	516	30	120	298	218	223	M150	150
81 – 85	4807	552	32	128	318	228	238	M160	160
86 – 90	5393	583	34	136	338	238	253	M170	170
91 – 95	6073	614	36	144	358	278	268	M180	180
96 – 100	6733	645	38	152	378	288	283	M190	190
101 – 105	7400	681	40	160	398	298	298	M200	200
106 – 110	8133	712	42	168	418	308	313	M210	210
111 – 115	8933	743	44	176	438	318	328	M220	220
116 – 120	9667	774	46	184	458	328	343	M230	230
121 – 125	10533	810	48	192	478	348	358	M240	240
126 – 130	10800	841	50	200	498	358	373	M250	250
131 – 135	11600	872	52	208	518	368	388	M260	260

1) Range of applicable nominal rope diameters

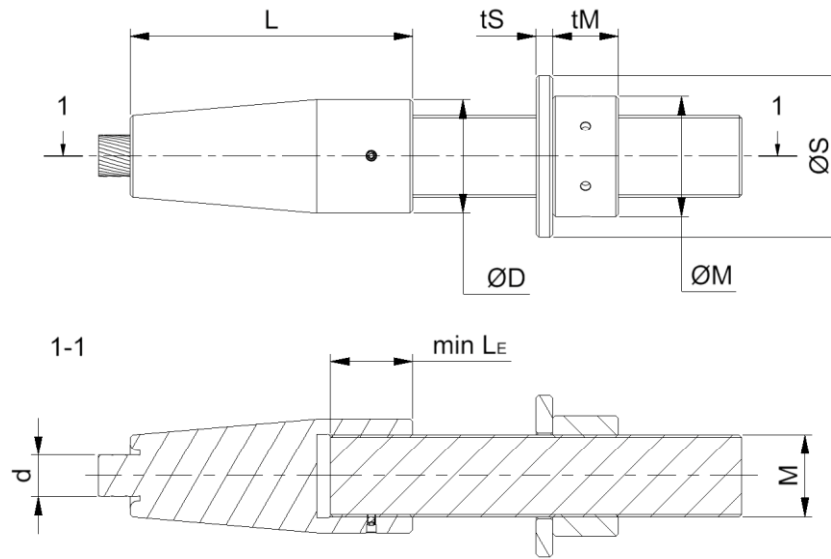
2) Design tension resistance of socket

3) Threads of nut shall be completely engaged. 4) Minimum engagement depth of threaded bar

FATZER HYEND tension components

HYEND Conical Spelter Socket with Threaded Bar and Nut – Galvanised steel

Annex D8



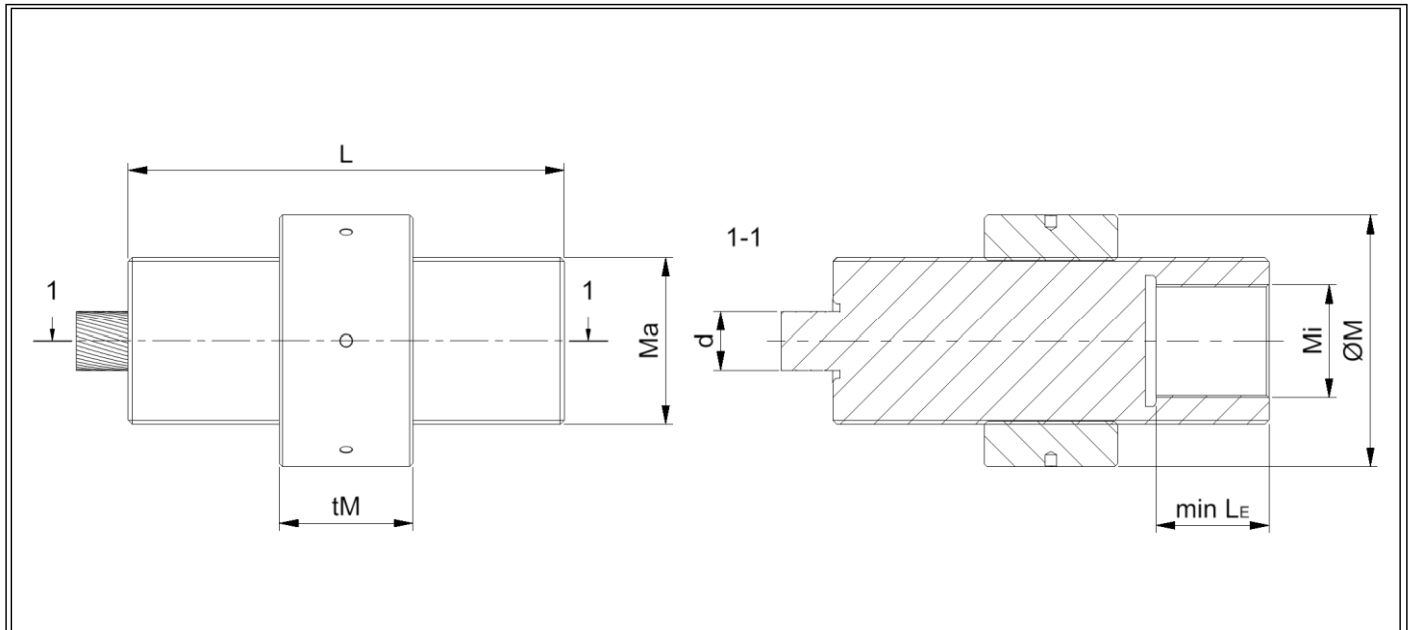
$d^{1)}$ [mm]	$N_{Rd}^{2)}$ [kN]	L [mm]	tS [mm]	tM ³⁾ [mm]	ØS [mm]	ØD [mm]	ØM [mm]	M [mm]	min $L_E^{4)}$ [mm]
21 – 25	347	170	9	36	88	68	68	M45	45
26 – 30	499	198	11	42	103	88	78	M52	52
31 – 35	680	236	13	52	128	98	98	M64	64
36 – 40	908	265	15	58	143	113	108	M72	72
41 – 45	1151	294	16	64	158	128	118	M80	80
46 – 50	1431	325	18	72	178	143	133	M90	90
51 – 55	1732	351	19	76	188	158	143	M95	95
56 – 60	2021	382	21	84	208	173	158	M105	105
61 – 65	2425	418	23	92	228	188	173	M115	115
66 – 70	2779	449	25	100	248	203	188	M125	125
71 – 75	3139	480	27	108	268	218	203	M135	135
76 – 80	3646	511	29	116	288	233	218	M145	145

- 1) Range of applicable nominal rope diameters
 2) Design tension resistance of socket
 3) Threads of nut shall be completely engaged.
 4) Minimum engagement depth of threaded bar

FATZER HYEND tension components

HYEND Conical Spelter Socket with Threaded Bar and Nut – Stainless steel

Annex D9



$d^{1)}$ [mm]	$N_{Rd}^{2)}$ [kN]	L [mm]	Ma [mm]	$tM^{3)}$ [mm]	Mi [mm]	ØM [mm]	min L_E [mm]
21 – 25	397	195	M76	61	M50	113	Minimum engagement depth of threaded bar. Threaded bar not covered by ETA. Design of threaded bar to EN 1993-1-8 by user.
26 – 31	611	230	M90	72	M60	133	
31 – 35	780	270	M100	80	M70	148	
36 – 40	1053	301	M115	92	M76	173	
41 – 45	1333	335	M125	100	M85	188	
46 – 50	1647	370	M145	116	M95	218	
51 – 55	2013	405	M155	124	M105	233	
56 – 60	2393	440	M175	140	M115	263	
61 – 65	2813	480	M185	148	M125	278	
66 – 70	3260	515	M200	160	M135	298	
71 – 75	3747	550	M220	176	M145	328	
76 – 80	4260	580	M230	184	M150	343	
81 – 85	4807	620	M240	192	M160	358	
86 – 90	5393	655	M250	200	M170	373	
91 – 95	6073	690	M290	232	M180	433	
96 – 100	6733	725	M300	240	M190	448	
101 – 105	7400	765	M310	248	M200	463	
106 – 110	8133	800	M320	256	M210	478	
111 – 115	8933	835	M330	264	M220	493	
116 – 120	9667	870	M350	280	M230	523	
121 – 125	10533	910	M360	288	M240	538	
126 – 130	10800	945	M370	296	M250	553	
131 – 135	11600	980	M380	308	M260	578	

1) Range of applicable nominal rope diameters

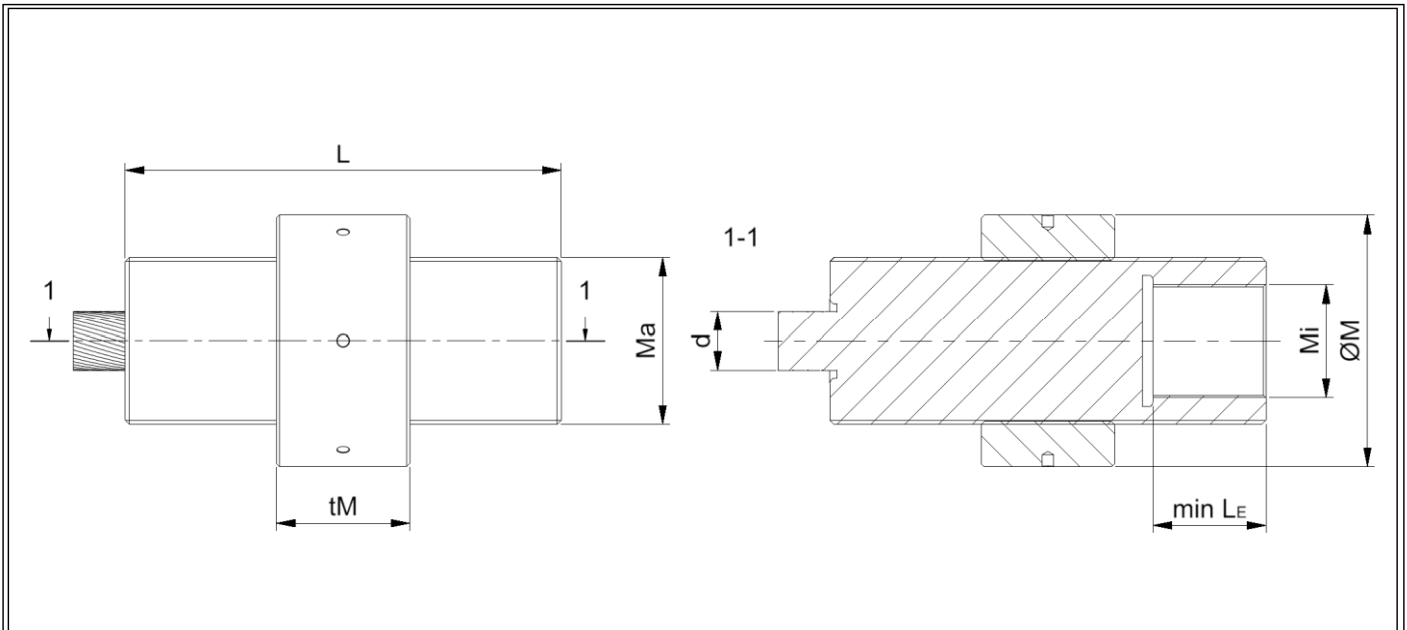
2) Design tension resistance of socket

3) Threads of nut shall be completely engaged.

FATZER HYEND tension components

HYEND Cylindrical Spelter Socket with Inward and Outward thread and Nut – Galvanised steel

Annex D10

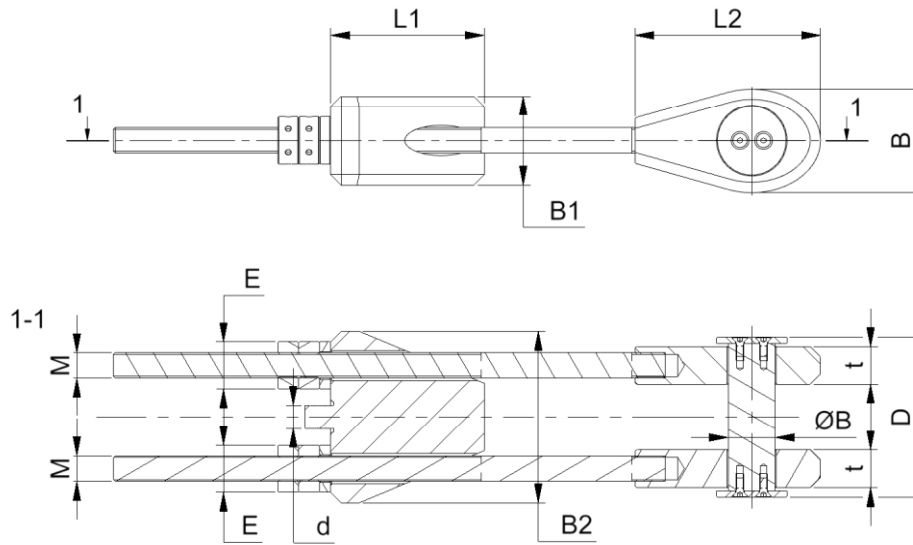


$d^{1)}$ [mm]	$N_{Rd}^{2)}$ [kN]	L [mm]	Ma [mm]	$tM^{3)}$ [mm]	Mi [mm]	ØM [mm]	min L_E [mm]
21 – 25	347	190	M76	61	M45	113	Minimum engagement depth of threaded bar. Threaded bar not covered by ETA. Design of threaded bar to EN 1993-1-8 by user.
26 – 30	499	222	M90	72	M52	133	
31 – 35	680	264	M100	80	M64	148	
36 – 40	908	297	M115	92	M72	173	
41 – 45	1151	330	M130	104	M80	193	
46 – 50	1431	365	M140	112	M90	208	
51 – 55	1732	395	M155	124	M95	233	
56 – 60	2021	430	M170	136	M105	253	
61 – 65	2425	470	M185	148	M115	278	
66 – 70	2779	505	M195	156	M125	293	
71 – 75	3139	540	M210	168	M135	313	
76 – 80	3646	575	M220	176	M145	328	

- 1) Range of applicable nominal rope diameters
 2) Design tension resistance of socket
 3) Threads of nut shall be completely engaged.

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FATZER HYEND tension components	Annex D11
HYEND Cylindrical Spelter Socket with Inward and Outward Thread and Nut – Stainless steel	



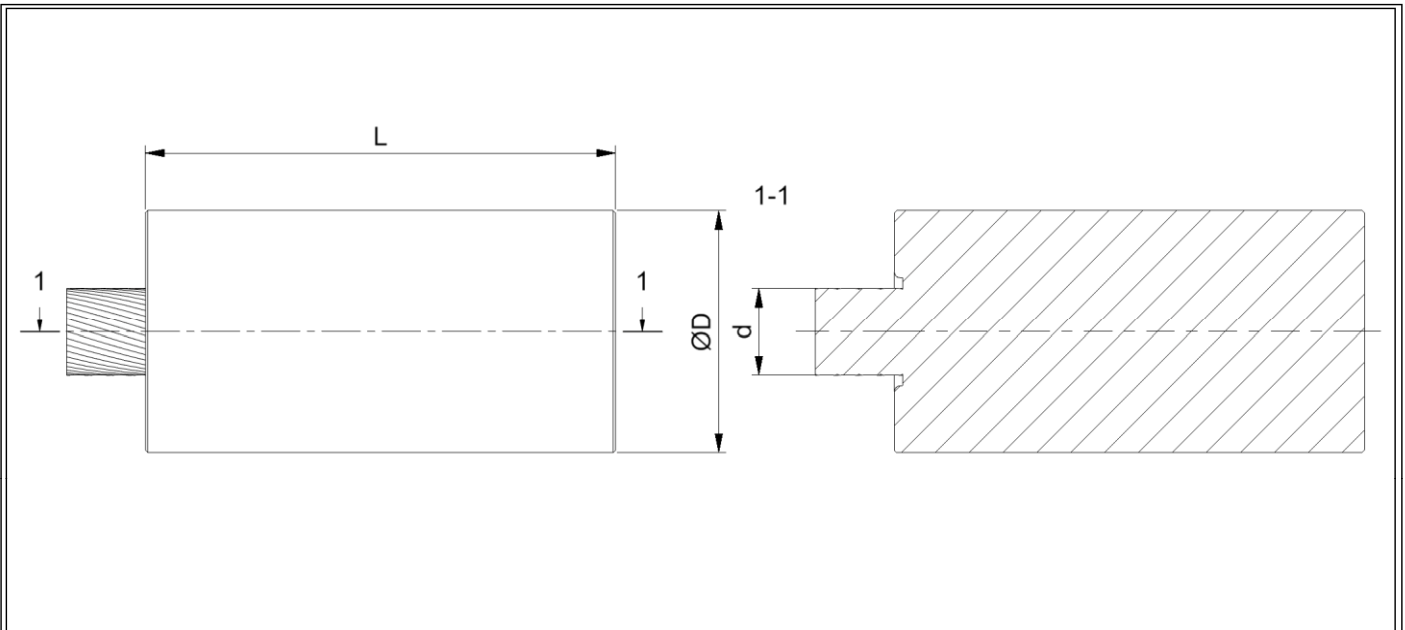
d ¹⁾ [mm]	N _{Rd} ²⁾ [kN]	L1 [mm]	L2 [mm]	B1 [mm]	B [mm]	E [mm]	B2 [mm]	ØB [mm]	D [mm]	t [mm]	M ³⁾ [mm]
21 – 25	397	163	197	94	110	50	182	50	170	40	M27
26 – 31	611	190	234	110	131	60	213	59	195	50	M33
31 – 35	780	220	267	125	147	70	243	67	224	60	M39
36 – 40	1053	245	304	141	172	75	279	76	266	68	M42
41 – 45	1333	275	342	159	191	90	312	87	284	75	M48
46 – 50	1647	300	374	177	211	90	333	95	305	80	M52
51 – 55	2013	330	419	195	233	105	377	105	338	90	M60
56 – 60	2393	360	457	211	257	110	404	115	360	95	M64
61 – 65	2813	390	493	229	280	115	435	124	385	100	M68
66 – 70	3260	415	528	247	301	120	463	131	409	105	M72
71 – 75	3747	445	561	266	323	125	491	141	439	115	M76
76 – 80	4260	475	600	281	346	130	518	150	460	120	M80
81 – 85	4807	505	633	299	363	135	552	159	491	130	M85
86 – 90	5393	535	671	318	386	150	583	168	522	135	M90
91 – 95	6073	565	710	336	409	155	616	179	556	145	M95
96 – 100	6733	595	757	351	431	170	666	189	594	160	M105
101 – 105	7400	625	795	370	452	180	698	198	618	165	M110
106 – 110	8133	650	833	388	474	190	731	208	648	175	M115
111 – 115	8933	680	871	406	497	195	764	217	677	180	M120
116 – 120	9667	715	904	422	514	205	794	226	704	190	M125
121 – 125	10533	745	945	440	540	210	829	236	730	195	M130
126 – 130	10800	780	968	458	549	215	862	241	760	205	M135
131 – 135	11600	818	1023	476	591	220	895	249	785	210	M140

- 1) Range of applicable nominal rope diameters
 2) Design tension resistance of socket
 3) Threads of both nuts and eyes shall be completely engaged.

FATZER HYEND tension components

HYEND Take-Up Spelter Socket – Galvanised steel

Annex D12



d ¹⁾ [mm]	N _{Rd} ²⁾ [kN]	L [mm]	ØD [mm]
21 – 25	397	145	67
26 – 31	611	170	83
31 – 35	780	200	93
36 – 40	1053	225	108
41 – 45	1333	250	118
46 – 50	1647	275	138
51 – 55	2013	300	148
56 – 60	2393	325	158
61 – 65	2813	355	178
66 – 70	3260	380	188
71 – 75	3747	405	208
76 – 80	4260	430	218
81 – 85	4807	460	228
86 – 90	5393	485	248
91 – 95	6073	510	278
96 – 100	6733	535	288
101 – 105	7400	565	298
106 – 110	8133	590	308
111 – 115	8933	615	319
116 – 120	9667	640	338
121 – 125	10533	670	348
126 – 130	10800	695	358
131 – 135	11600	720	368

1) Range of applicable nominal rope diameters

2) Design tension resistance of socket

FATZER HYEND tension components

HYEND Cylindrical Spelter Socket – Galvanised steel

Annex D13