Deutsches Institut für Bautechnik

Public-law institution jointly founded by the federal states and the Federation

European Technical Assessment Body for construction products

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European Technical Assessment ETA-24/1184 of 16 January 2025

English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the European Technical Assessment:	Deutsches Institut für Bautechnik
Trade name of the construction product	DEXTRA Tension Rod System
Product family to which the construction product belongs	Prefabricated tension rod systems with special end connectors
Manufacturer	DEXTRA MANUFACTURING Co., Ltd. Lumpini II Building 247 Sarasin Road Bangkok 10330 THAILAND
Manufacturing plant	DEXTRA manufacturing plants
This European Technical Assessment contains	20 pages including 15 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 200032-00-0602

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Specific part

1 Technical description of the product

The construction product "DEXTRA Tension Rod System" is a prefabricated tension rod system of different system sizes used as a kit. The tension rod system consists of steel bars (tension rods) with external threads which are connected to each other and to the corresponding structure by special connecting devices. The tension rods are connected to the corresponding structure by steel fork end connectors or by steel spades with eye loops and internal thread. The fork end connectors and spades are connected by double shear pin connections to corresponding steel gusset plates (the steel gusset plates are not part of the product). The tension rods are connected to each other by threaded steel sleeves (couplers, turnbuckles or cross turnbuckles), or by a fork end combination with a spade.

The tension rod system comprises tension rods, fork end connectors, spades, pins and threaded sleeves with metric ISO threads M 16 to M 133.

Drawings of the tension rod system and the components as well as the essential dimensions of the components are given in the Annexes to this ETA.

The dimensions, tolerances and materials of the components of the tension rod system not indicated in Annexes shall correspond to the respective values and information laid down in the technical documentation[1] to this European Technical Assessment.

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

The tension rod system is intended for the use in structures with static or quasi-static loads in accordance with EN 1990[2], where no verification of fatigue relating to EN 1993-1-9[3] is necessary.

The intended use comprises for instance the suspension of roof structures or vertical glazing as well as bracings and truss structures.

The tension rod system is not subjected to systematic bending.

The performances given in Section 3 are only valid if the "Dextra Tension Rod System" is used in compliance with the specifications and conditions given in Annex A and Annexes B1 to B14.

The verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of the "Dextra Tension Rod System" 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.

[1] 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.

[2] EN 1990:2002 + A1:2005 + A1:2005/AC2010 Eurocode: Basis of structural design

[3] EN 1993-1-9:2005 + AC:2009 Eurocode 3: Design of steel structures - Part 1-9: Fatigue

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

3.1 Mechanical resistance and stability (BWR 1)

3.1.1 Fork end connector, spade, pin, threaded sleeves

Essential characteristic	Performance
Geometry incl. tolerances	See Annex B3, B4, B6 to B9 and B11
Dimensions incl. tolerances	
Thread incl. tolerances	
Material	See Annex B2
Load bearing capacity	See Annex B13 and B14
Resistance to corrosion	NPA

3.1.2 Tension rod

Essential characteristic	Performance
Nominal rod diameter	See Annex B12
Thread incl. tolerances	
Yield strength	See Annex B2
Tensile strength	
Material	
Tension resistance	See Annex B13 and B14
Compression force	NPA
Resistance to corrosion	NPA

3.2 Safety in case of fire (BWR 2)

Tension rod, fork end connector, spade, pin, threaded sleeves

Essential characteristic	Performance
Reaction to fire	Class A1 in accordance with EN 13501-1:2007+A1:2009

The components of the tension rod system 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. 200032-00-0602, the applicable European legal act is: [98/214/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 16 January 2025 by Deutsches Institut für Bautechnik

Dr.-Ing. Ronald Schwuchow
Head of Section

beglaubigt:
Bertram

A.1 Assumptions concerning design

The design of the tension rod system is carried out under the following conditions:

The loading is static or quasi-static in accordance with EN 1990:2002 without need of verification of fatigue relating to EN 1993-1-9:2005.

The tension rod systems are not used, when constructions are susceptible to vibrations under wind loads or wind-induced cross vibrations of the entire construction appear.[1]

Dimensions, material properties and minimum screw-in lengths are observed. The minimum screw depth is 110% (1.1 times) of the diameter of the rod based on the diameter of the tabulated M size in mm. It applies to all screw connections with the exception of the lock cover in Annex B10 which only serves to secure the position of the connection.

The tension rod system is not subjected to systematic bending.

The verification concept stated in EN 1990:2002 as well as the design values of resistance stated below are used for design.

The rules given in EN 1090-2:2008 and EN ISO 12944:1998 are taken into account.

Design is carried out by the designer of the structure experienced in the field of steel structures using the load bearing capacity in the Annexes B13 and B14.

A.2 Assumptions concerning installation

The installation of the tension rod system is carried out under the following conditions:

The installation is only carried out in accordance with 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 tension rod system shall be checked for their perfect condition and that damaged components shall not be used.

The fork end connectors are not subjected to sudden or impact loads (for instance pins shall not be adjusted by hammer blows).

The minimum screw-in lengths are marked in an appropriate way. The compliance of the minimum screw-in lengths, given in Annex A Section A.1, is checked by the assembler in accordance with the assembly instructions. The compliance of the screw-in lengths shall be attested with a written confirmation by a person responsible for the construction site.

The pins of the tension rod system are secured in their position by screwed-on washers.

All relevant components shall be checked continuously regarding corrosion damage after installation. The result of the checks shall be recorded.

The conformity of the installed tension rod system with the provisions of the ETA is attested by the executing assembler.

A.3 Indications to the manufacturer

The manufacturer ensures that the information on the specific conditions is given to those who are concerned.

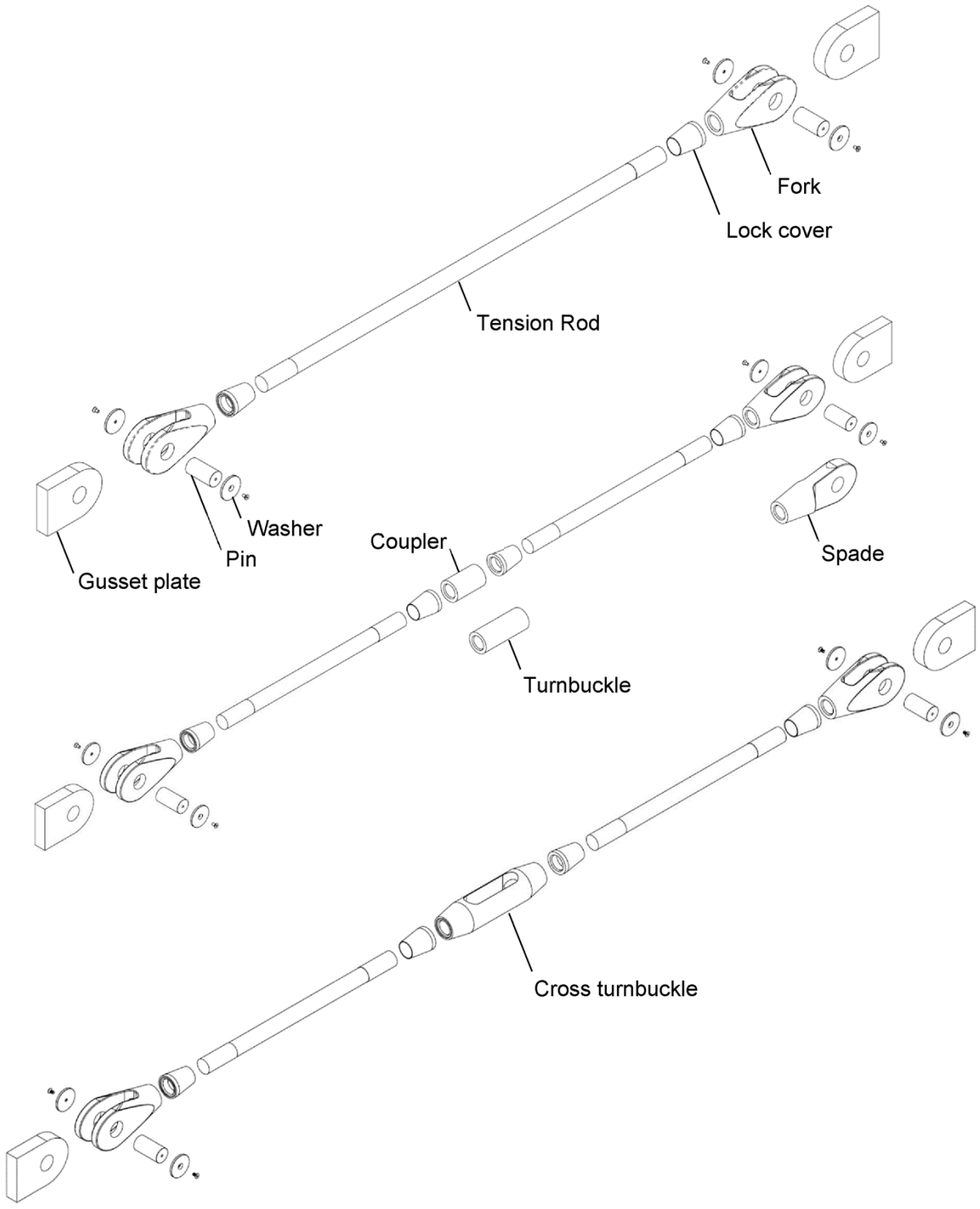
All essential installation data (e. g. minimum screw-in length in accordance with Annex A Section A.1) shall be shown clearly on the package and/or on an enclosed instruction sheet, preferably using illustration(s).

The prefabricated tension rod system should be packaged and shipped as a complete unit when feasible, or as individual components ready to be assembled.

The different grades 355, 460 and 520 of the tension rods shall be clearly marked to the tensions rods to prevent confusion.

[1] The national provisions of the Member State applicable for the location where the product is incorporated in the works shall be taken into account.

DEXTRA Tension Rod System	**Annex A**
Assumptions concerning design and installation, Indications to the manufacturer	



DEXTRA Tension Rod System	**Annex B1**
System, Components	

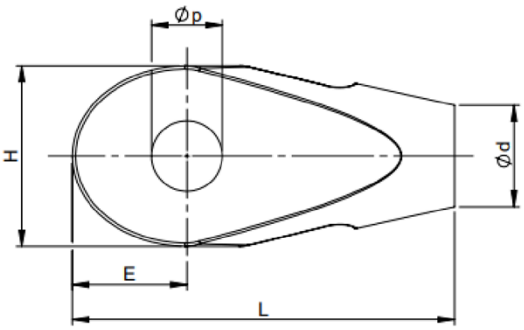
Deutsches Institut für Bautechnik DIBt

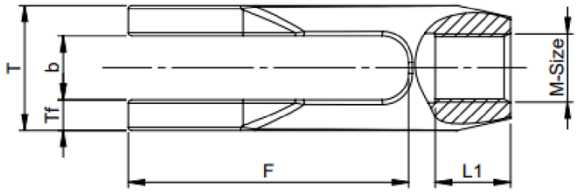
Component	Material				System size	Mechanical Properties	
	Material or Steel Grade	Material number	Standard	Technical delivery condition		Yield strength $R_{p0.2}$ (N/mm^2)	Tensile Strength R_m (N/mm^2)
Tension Rod Grade 355	S355J2	1.0577	EN 10025-2	+N (normalized) or +AR (as-rolled)	M16 – M133	355	510
Tension Rod Grade 460	S460N	1.8901	EN 10025-3	+N (normalized)	M16 – M133	460	625
	S355J2	1.0577	EN 10025-2	+QT (Quenched and tempered)			
Tension Rod Grade 520	S355J2	1.0577	EN 10025-2	+QT (Quenched and tempered)	M16 – M133	520	670
Fork / Spade	G24Mn6+QT3	1.1118	EN 10340	+QT (Quenched and tempered)	M16 – M133	400	600-800
Pin	50CrMo4	1.7228	EN ISO 683-2	+QT (Quenched and tempered)	M16 – M133	835	1030
	36CrNiMo4	1.6511					
	34CrNiMo6	1.6582					
	30CrNiMo8	1.6580					
	50CrMo4	1.7228	EN ISO 683-2	(for ø ≤ 100 mm)			
Couplers / Turnbuckles / Cross turnbuckles	S355J2	1.0577	EN 10025-2	+QT (Quenched and tempered)	M16 – M133	600	800
	S355J2H	1.0576	EN 10210-1				
Lock covers / Washers	S235JR	1.0038	EN 10025-2	+DC (delivery condition at manufacturer's discretion)	M16 – M133	245	400
Gusset Plate	S355J2	1.0577	EN 10025-2		t < 16	355	470
					16 < t < 40	345	
					40 < t < 63	335	
					63 < t < 80	325	
					80 < t < 100	315	
					100 < t < 150	295	450

DEXTRA Tension Rod System

Material properties of the components

Annex B2





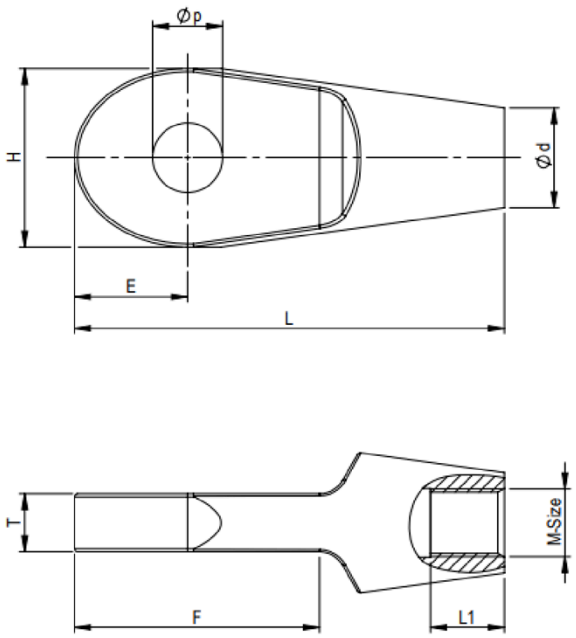
No.	M-size (RH & LH)	L [mm]	L1 [mm]	H [mm]	Ød [mm]	Øp [mm]	T [mm]	b [mm]	Tf [mm]	E [mm]	F [mm]
1	M16	108	19	46	26	18	30.5	15.5	7.5	29	82
2	M20	128.5	24	54	32	22	36.5	18.5	9	34	96
3	M24	147	29	63	38	25	44.5	23.5	10.5	40	108
4	M30	180.5	35	78	46	31	55	29	13	50	132
5	M36	212	42	93	55	37	66.5	34.5	16	59	154
6	M42	244.5	52.5	109	65	43	76.5	39.5	18.5	69	177
7	M48	278	59	125	70	49	88	45	21.5	79	201
8	M52	296	59	136	80	53	91	45	23	86	213
9	M56	322.5	64	147	85	58	99	50	24.5	93	236
10	M64	357	74	169	95	66	117	60	28.5	107	262
11	M68	370	78	177	100	69	121	60	30.5	112	268
12	M78	430	89	208	115	82	146	76	35	132	316
13	M83	448	95	219	130	86	151	76	37.5	139	334
14	M88	485	103	237	130	92	157	76	40.5	149	357
15	M93	491	106	246	140	96	172	87	42.5	155	367
16	M98	523	111	261	150	102	182	93	44.5	165	389
17	M103	542	116	277	150	106	187	93	47	174	401
18	M113	594	129	303	170	116	202	98	52	190	440
19	M123	634	139	329	180	126	232	118	57	207	472
20	M133	678	149	354	200	135	251	128	61.5	222	504

RH – righthand thread
LH – lefthand thread

DEXTRA Tension Rod System

Dimensions of forks (RH x LH)

Annex B3

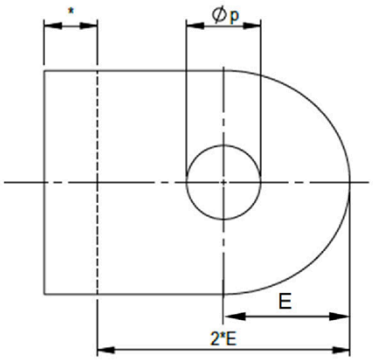


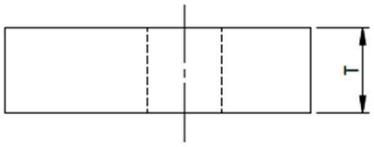
No.	M-size (RH & LH)	L [mm]	L1 [mm]	H [mm]	Ød [mm]	Øp [mm]	T [mm]	E [mm]	F [mm]
1	M16	127	32	46	26	18	12	29	70
2	M20	152.2	40	54	32	22	18	34	82
3	M24	176.6	48	63	38	25	20	40	92
4	M30	205.8	35	78	46	31	26	50	113
5	M36	241.9	42	93	55	37	32	59	132
6	M42	287.3	52.5	109	65	43	37	69	152
7	M48	326.7	59	125	70	49	42	79	173
8	M52	341.7	59	136	80	53	45	86	186
9	M56	370.5	64	147	85	58	50	93	206
10	M64	407	74	169	95	66	55	107	232
11	M68	420.6	78	177	100	69	60	112	240
12	M78	487	89	208	115	82	70	132	286
13	M83	507	95	219	130	86	75	139	303
14	M88	547.2	103	237	130	92	80	149	327
15	M93	554.3	106	246	140	96	85	155	337
16	M98	589.4	111	261	150	102	90	165	359
17	M103	614.4	116	277	150	106	90	174	374
18	M113	671.1	129	303	170	116	100	190	412
19	M123	713	139	329	180	126	110	207	444
20	M133	763.7	149	354	200	135	120	222	476

DEXTRA Tension Rod System

Dimensions of spades (RH x LH)

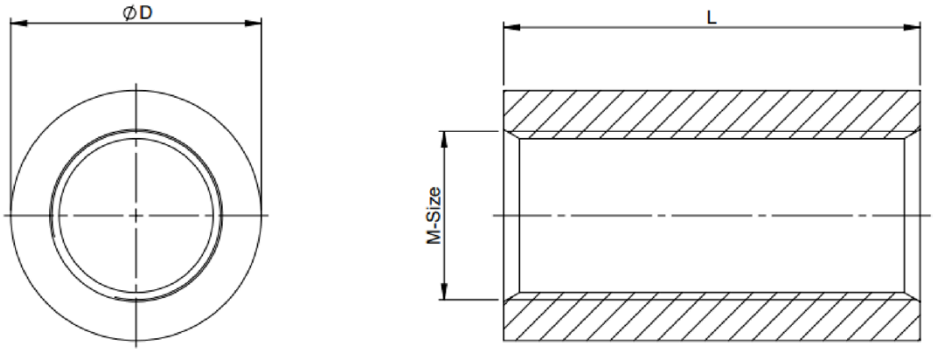
Annex B4





No.	M-Size	Øp	T	E	2*E
1	M16	18	12	31	62
2	M20	22	15	38	76
3	M24	25	20	42	84
4	M30	31	25	53	106
5	M36	37	30	63	126
6	M42	43	35	74	148
7	M48	49	40	85	170
8	M52	53	40	94	188
9	M56	58	45	101	202
10	M64	66	55	113	226
11	M68	69	55	122	244
12	M78	82	70	140	280
13	M83	86	70	151	302
14	M88	92	70	167	334
15	M93	96	80	169	338
16	M98	102	85	181	362
17	M103	106	85	192	384
18	M113	116	90	214	428
19	M123	126	110	229	458
20	M133	135	120	246	492
Gusset plates are not part of the construction product. All data are informative. The dimensions should be defined on project basis.					

DEXTRA Tension Rod System	**Annex B5**
Dimensions of the gusset plates	

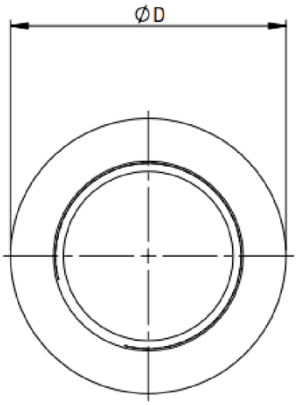


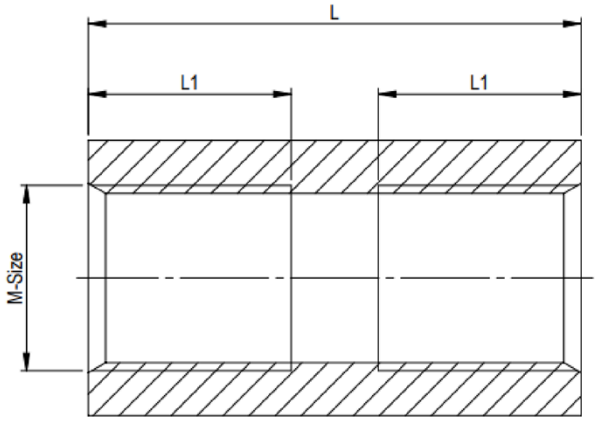
No.	M-size	ØD [mm]	L [mm]
1	M16	26	42
2	M20	32	52.5
3	M24	38	63
4	M30	46	77.5
5	M36	55	92
6	M42	65	106.5
7	M48	70	121
8	M52	80	129
9	M56	85	139.5
10	M64	95	158
11	M68	100	166
12	M78	115	186
13	M83	130	196
14	M88	130	206
15	M93	140	216
16	M98	150	226
17	M103	150	236
18	M113	170	256
19	M123	180	276
20	M133	200	296

DEXTRA Tension Rod System

Dimensions of couplers

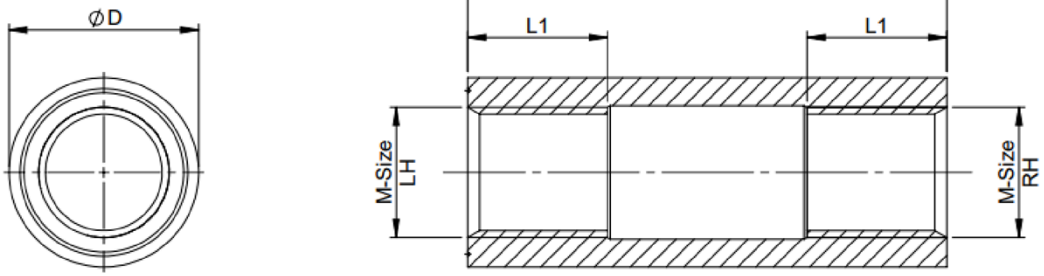
Annex B6





No.	M-size	ØD [mm]	L [mm]	L1 [mm]
1	M16	26	51	20.5
2	M20	32	62.5	25
3	M24	38	75	30
4	M30	46	89.5	36
5	M36	55	106	43
6	M42	65	123.5	50.5
7	M48	70	138	56.5
8	M52	80	147	61
9	M56	85	159.5	66
10	M64	95	180	75
11	M68	100	189	79.5
12	M78	115	211	90.5
13	M83	130	222	96
14	M88	130	233	101.5
15	M93	140	244	107
16	M98	150	255	112.5
17	M103	150	266	118
18	M113	170	288	129
19	M123	180	310	140
20	M133	200	332	151

DEXTRA Tension Rod System	**Annex B7**
Dimensions of coupler with stopper	

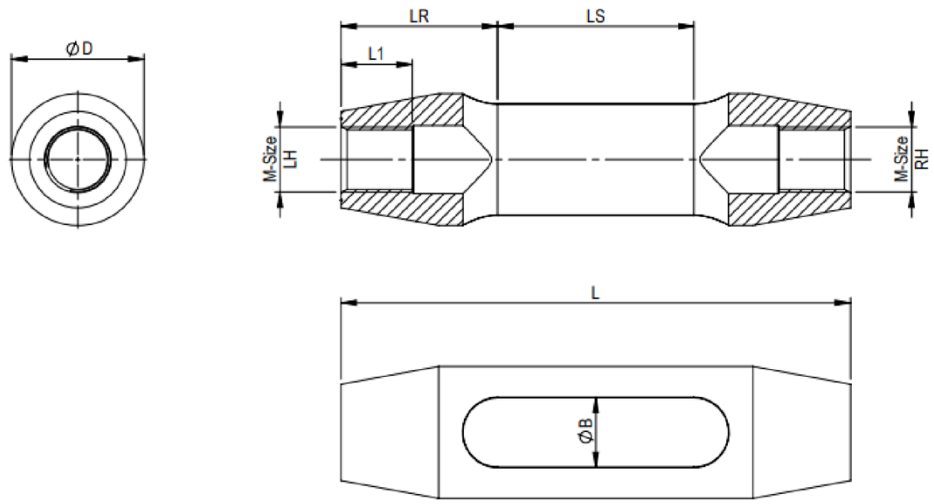


No.	M-size (RH & LH)	ØD [mm]	L [mm]	L1 [mm]
1	M16	26	88	19
2	M20	32	98	24
3	M24	38	108	29
4	M30	46	170	35
5	M36	55	184	42
6	M42	65	198	49
7	M48	70	210	55
8	M52	80	218	59
9	M56	85	228	64
10	M64	95	248	74
11	M68	100	256	78
12	M78	115	278	89
13	M83	130	290	95
14	M88	130	300	100
15	M93	140	312	106
16	M98	150	322	111
17	M103	150	334	117
18	M113	170	356	128
19	M123	180	378	139
20	M133	200	400	150

DEXTRA Tension Rod System

Dimensions of turnbuckle (RH & LH)

Annex B8

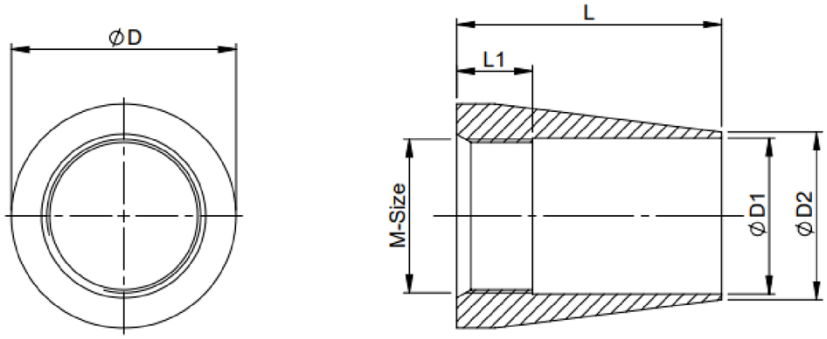


No.	M-size (RH & LH)	ØD [mm]	L [mm]	LR [mm]	LS [mm]	ØB [mm]	L1 [mm]
1	M16	35	141	45	51	20	19
2	M20	42	174	56	62	24	24
3	M24	50	208	67	74	28	29
4	M30	60	254	82	90	34	35
5	M36	75	306	98	110	40	42
6	M42	85	355	114	127	46	49
7	M48	95	401	129	143	52	55
8	M52	105	430	137	156	56	59
9	M56	110	454	144	166	60	64
10	M64	130	509	158	193	68	74
11	M68	140	535	164	207	72	78
12	M78	160	597	180	237	82	89
13	M83	170	628	188.5	251	87	95
14	M88	180	658	196	266	92	100
15	M93	190	690	204.5	281	97	106
16	M98	200	720	212	296	102	111
17	M103	210	752	220.5	311	107	117
18	M113	230	814	236.5	341	117	128
19	M123	250	876	252.5	371	127	139
20	M133	270	938	268.5	401	137	150

DEXTRA Tension Rod System

Dimensions of cross turnbuckle (RH & LH)

Annex B9



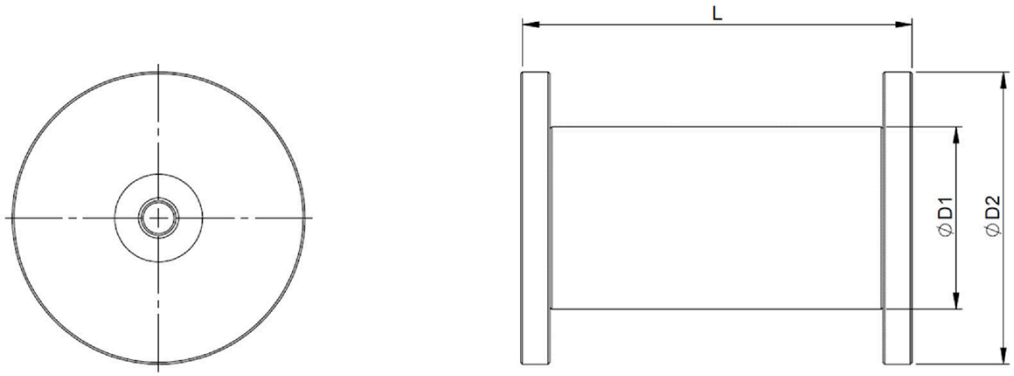
**Lock cover may contain a hole according to customer specifications to facilitate assembly, allow grease injection for rust prevention, and provide lubrication.*

No.	M-size (RH & LH)	ØD [mm]	ØD1 [mm]	ØD2 [mm]	L [mm]	L1 [mm]
1	M16	26	18	23	34	8
2	M20	32	22	27	43	10
3	M24	38	26	31	51	12
4	M30	46	32	37	83	15
5	M36	55	38	43	88	18
6	M42	65	44	49	94	21
7	M48	70	50	55	99	24
8	M52	80	54	59	101	26
9	M56	85	58	63	106	28
10	M64	95	66	71	112	32
11	M68	100	70	75	114	34
12	M78	115	80	85	119	39
13	M83	130	85	90	122	42
14	M88	130	90	95	124	44
15	M93	140	100	105	127	49
16	M98	150	100	105	129	49
17	M103	150	105	110	132	52
18	M113	170	115	120	137	57
19	M123	180	125	130	142	62
20	M133	200	135	140	147	67

DEXTRA Tension Rod System

Dimensions of lock cover (RH & LH)

Annex B10

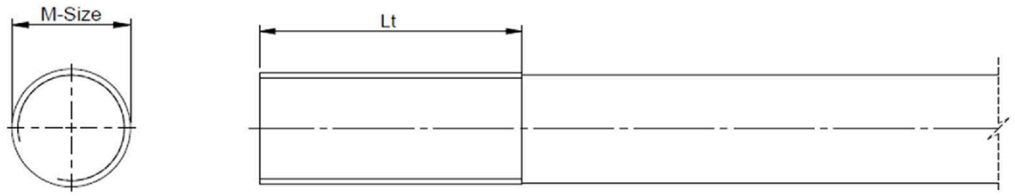


No.	Use for M-size (System size)	ØD1 [mm]	ØD2 [mm]	L for Fork [mm]	L for Spade [mm]
1	M16	16	26	33	36
2	M20	20	32	39	46
3	M24	23	38	47.5	50
4	M30	29	46	58	62
5	M36	35	55	69.5	76
6	M42	40	65	79.5	85
7	M48	46	70	91.5	96
8	M52	50	80	94.5	109
9	M56	54	85	102.5	114
10	M64	62	95	120.5	131
11	M68	65	100	124.5	136
12	M78	77	115	150	166
13	M83	81	130	155	171
14	M88	87	130	161	186
15	M93	91	140	176	191
16	M98	97	150	186	206
17	M103	100	150	191	206
18	M113	110	170	206.5	226
19	M123	120	180	236.5	246
20	M133	129	200	255.5	266

DEXTRA Tension Rod System

Dimensions of pin and washer for fork & spade

Annex B11



No.	M-size (System size)	Ø Tension Rod [mm]	Gross cross section area of the bar A [mm2]	Net cross section area of the thread A_s [mm2]	Min. thread engagement length $L_{t,min}$ [mm]	Nom. thread engagement length Fork and Spades $L_{t,nom}$ [mm]	Nom. thread engagement length Turnbuckle and Cross Turnbuckle $L_{t,nom}$ [mm]	Nom. thread length* L_{nom} [mm]
1	M16	15	176.7	156.7	18	27 ± 8	43 ± 25	29
2	M20	19	283.5	244.8	23	34 ± 10	47.5 ± 25	35
3	M24	23	415.5	352.5	27	41 ± 12	52 ± 25	42
4	M30	28	615.8	560.6	34	50 ± 15	83.5 ± 50	51
5	M36	34	907.9	816.7	40	60 ± 18	90 ± 50	61
6	M42	40	1256.6	1120.9	53	73.5 ± 21	96.5 ± 50	72
7	M48	45	1590.4	1473.1	59	83 ± 25	103 ± 50	81
8	M52	49	1885.7	1757.8	57	84 ± 25	107 ± 50	87
9	M56	53	2206.2	2030.0	64	89 ± 25	111.5 ± 50	94
10	M64	61	2922.5	2676.0	70	99 ± 25	120 ± 50	107
11	M68	65	3318.3	3055.3	74	103 ± 25	124 ± 50	114
12	M78	75	4417.9	4113.5	89	114 ± 25	134 ± 50	130
13	M83	80	5026.5	4701.6	89	120 ± 25	139 ± 50	138
14	M88	85	5674.5	5328.9	103	128 ± 25	144 ± 50	146
15	M93	90	6361.7	5995.5	99	131 ± 25	149 ± 50	156
16	M98	95	7088.2	6701.3	109	136 ± 25	154 ± 50	162
17	M103	100	7854.0	7446.4	116	141 ± 25	159 ± 50	170
18	M113	110	9503.3	9054.4	129	154 ± 25	169 ± 50	185
19	M123	120	11309.7	10819.6	136	164 ± 25	179 ± 50	200
20	M133	130	13273.2	12741.8	149	174 ± 25	189 ± 50	215

**Depending on the configuration and adjustment requirements the tension rod might be supplied with extended thread length*

Note:
The tension rods are available in different material qualities according to Annex B2. The marking of the tie rods due to the different load-bearing capacities must be observed.

DEXTRA Tension Rod System

Dimensions of tension rods threads for grade 355, 460 and 520

Annex B12

M-Size (System size)	Characteristic unfactored plastic tension resistance of the tension rod system $A \cdot f_{y,k}$ [kN]			Characteristic unfactored ultimate tension resistance of the tension rod system $A_s \cdot f_{u,k}$ [kN]		
	Grade 355	Grade 460	Grade 520	Grade 355	Grade 460	Grade 520
M16	63	81	92	80	98	105
M20	101	130	147	125	153	164
M24	147	191	216	180	220	236
M30	219	283	320	286	350	376
M36	322	418	472	417	510	547
M42	446	578	653	572	701	751
M48	565	732	827	751	921	987
M52	669	867	981	897	1099	1178
M56	783	1015	1147	1035	1269	1360
M64	1037	1344	1520	1365	1672	1793
M68	1178	1526	1726	1558	1910	2047
M78	1568	2032	2297	2098	2571	2756
M83	1784	2312	2614	2398	2938	3150
M88	2014	2610	2951	2718	3331	3570
M93	2258	2926	3308	3058	3747	4017
M98	2516	3261	3686	3417	4188	4490
M103	2788	3613	4084	3798	4654	4989
M113	3374	4372	4942	4618	5659	6066
M123	4015	5202	5881	5518	6762	7249
M133	4712	6106	6902	6498	7964	8537

A = Gross cross section area of the tension rod in accordance with Annex B12
A_s = Net cross section area of the threaded part of the tension rod in accordance with Annex B12
$f_{y,k}$ = characteristic value of the yield strength of the tension rod according to $R_{p0,2}$ given in Annex B2
$f_{u,k}$ = characteristic value of the tensile strength of the tension rod according to R_m given in Annex B2

DEXTRA Tension Rod System

Characteristic tension resistance of Dextra tension rod system

Annex B13

M-Size (System size)	Design tension resistance of the tension rod system $F_{t,Rd}$ in accordance with EN 1993-1-1* [kN]		
	Grade 355	Grade 460	Grade 520
M16	58	71	76
M20	90	110	118
M24	129	159	170
M30	206	252	270
M36	300	368	394
M42	412	504	541
M48	541	663	711
M52	645	791	848
M56	745	914	979
M64	983	1204	1291
M68	1122	1375	1474
M78	1510	1851	1984
M83	1726	2116	2268
M88	1957	2398	2571
M93	2202	2698	2892
M98	2461	3016	3233
M103	2734	3351	3592
M113	3325	4075	4368
M123	3973	4869	5219
M133	4679	5734	6147

*The design values are calculated as example according to EN 1993-1-1:2005 +AC:2009 and EN 1993-1-8:2005 +AC:2009 as follows:

$$\mathbf{F_{t,Rd}} = \mathbf{F_{t,Rd,Tension\ Rod}} = \min\left\{\frac{A \cdot f_{y,k}}{\gamma_{M0}};\ 0.9 \cdot \frac{A_s \cdot f_{u,k}}{\gamma_{M2}}\right\}$$

γ_{M0} = 1.00
γ_{M2} = 1.25

The values given for the partial safety factors γ_{M0} and γ_{M2} are recommended minimum values according EN 1993-1-1. The design rules and safety factors of the respective Member State apply.

DEXTRA Tension Rod System	**Annex B14**
Design tension resistance of Dextra tension rod system	