



European Technical Approval ETA-04/0039

English translation prepared by DIBt - Original version in German language

Handelsbezeichnung
Trade name

Pfeifer Zugstabsystem 860

Zulassungsinhaber
Holder of approval

Pfeifer Seil- und Hebeteknik GmbH
Dr.-Karl-Lenz-Str. 66
87700 Memmingen

Zulassungsgegenstand
und Verwendungszweck
*Generic type and use
of construction product*

Vorgefertigtes Zugstabsystem
Prefabricated tension rod system

Geltungsdauer:
Validity: vom
from
bis
to

11 June 2013
11 June 2018

Herstellwerk
Manufacturing plant

Pfeifer Seil- und Hebeteknik GmbH
Dr.-Karl-Lenz-Str. 66
87700 Memmingen
GERMANY

Diese Zulassung umfasst
This Approval contains

15 Seiten einschließlich 7 Anhänge
15 pages including 7 annexes

Diese Zulassung ersetzt
This Approval replaces

ETA-04/0039 mit Geltungsdauer vom 22.07.2009 bis 22.07.2014
ETA-04/0039 with validity from 22.07.2009 to 22.07.2014

I LEGAL BASES AND GENERAL CONDITIONS

- 1 This European technical approval is issued by Deutsches Institut für Bautechnik in accordance with:
 - Council Directive 89/106/EEC of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products¹, modified by Council Directive 93/68/EEC² and Regulation (EC) N° 1882/2003 of the European Parliament and of the Council³;
 - *Gesetz über das In-Verkehr-Bringen von und den freien Warenverkehr mit Bauprodukten zur Umsetzung der Richtlinie 89/106/EWG des Rates vom 21. Dezember 1988 zur Angleichung der Rechts- und Verwaltungsvorschriften der Mitgliedstaaten über Bauprodukte und anderer Rechtsakte der Europäischen Gemeinschaften (Bauproduktengesetz - BauPG) vom 28. April 1998⁴, as amended by Article 2 of the law of 8 November 2011⁵;*
 - Common Procedural Rules for Requesting, Preparing and the Granting of European technical approvals set out in the Annex to Commission Decision 94/23/EC⁶.
- 2 Deutsches Institut für Bautechnik is authorized to check whether the provisions of this European technical approval are met. Checking may take place in the manufacturing plant. Nevertheless, the responsibility for the conformity of the products to the European technical approval and for their fitness for the intended use remains with the holder of the European technical approval.
- 3 This European technical approval is not to be transferred to manufacturers or agents of manufacturers other than those indicated on page 1, or manufacturing plants other than those indicated on page 1 of this European technical approval.
- 4 This European technical approval may be withdrawn by Deutsches Institut für Bautechnik, in particular pursuant to information by the Commission according to Article 5 (1) of Council Directive 89/106/EEC.
- 5 Reproduction of this European technical approval including transmission by electronic means shall be in full. However, partial reproduction can be made with the written consent of Deutsches Institut für Bautechnik. In this case partial reproduction has to be designated as such. Texts and drawings of advertising brochures shall not contradict or misuse the European technical approval.
- 6 The European technical approval is issued by the approval body in its official language. This version corresponds fully to the version circulated within EOTA. Translations into other languages have to be designated as such.

¹ Official Journal of the European Communities L 40, 11 February 1989, p. 12
² Official Journal of the European Communities L 220, 30 August 1993, p. 1
³ Official Journal of the European Union L 284, 31 October 2003, p. 25
⁴ *Bundesgesetzblatt Teil I 1998*, p. 812
⁵ *Bundesgesetzblatt Teil I 2011*, p. 2178
⁶ Official Journal of the European Communities L 17, 20 January 1994, p. 34

II SPECIFIC CONDITIONS OF THE EUROPEAN TECHNICAL APPROVAL

1 Definition of the product and intended use

1.1 Definition of the construction product

The construction product is a prefabricated tension rod system of different sizes (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 cast fork end connectors with two eye loops and internal thread. The fork end connectors are connected by double shear pin connections to corresponding steel gusset plates. The tension rods are connected to each other by steel threaded sleeves.

The tension rod system comprises tension rods, fork end connectors and threaded sleeves (couplers, adapters) with metric ISO threads M 10 to M 100.

A drawing 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.

1.2 Intended use

The tension rod system is intended for the use in structures with predominantly static loads. Furthermore the installed tension rod system shall be accessible (in order) to facilitate replacement of individual components at any time.

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

The fork end connectors may also be connected to compression bars. The compression bars themselves are not part of the ETA.

The provisions made in this European technical approval are based on an assumed working life of the tension rod system of 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.

2 Characteristics of the product and methods of verification

2.1 Characteristics of product

2.1.1 Dimensions

The dimensions of the components of the tension rod system shall correspond to the drawings given in Annexes 3 to 7. The dimensions and tolerances of the components of the tension rod system not indicated in Annexes 3 to 7 shall correspond to the respective values and information laid down in the technical documentation⁷ to this European technical approval.

⁷ The technical documentation to this European technical approval 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.

2.1.2 Material properties

The material properties of the components of the tension rod system shall correspond to the values and European standards given in Annex 2. The relation to the different components is given in Annexes 3 to 7.

The material characteristics of the components of the tension rod system not indicated in Annex 2 shall correspond to the respective values and information laid down in the technical documentation⁷ to this European technical approval.

The inner and outer nature of ductile cast iron fork end connectors has to be in accordance with quality class SP2, LP2 and AP2 according to EN 1371-1:2011 and quality class 2 according to EN 12680-3:2011.

2.1.3 Design values of resistance

2.1.3.1 Design tension resistance of the entire tension rod system

The design value N_{Rd} of the tension resistance of the entire tension rod system (tension rods, fork end connectors incl. pins, couplers, adapters and gusset plates) is the minimum value of the design tension resistance $N_{Rd, Tension Rod}$ of the tension rod and the design bearing resistance $N_{Rd, Gusset Plate}$ of the gusset plate.

The design values shall be determined according to EN 1993-1-1:2005 and EN 1993-1-8:2005 as follows:

$$N_{Rd, Tension Rod} = \min \{ A \cdot f_{y,k} / \gamma_{M1}; 0.9 \cdot A_S \cdot f_{u,k} / \gamma_{M2} \}$$

A = minimum cross section of the unthreaded part of the tension rod
 A_S = cross section of the threaded part of the tension rod
 $f_{y,k}$ = characteristic value of the yield strength of the tension rod material according to $R_{p0,2}$ given in Annex 2
 $f_{u,k}$ = characteristic value of the tensile strength of the tension rod material according to R_m given in Annex 2
 $N_{Rd, Gusset Plate} = 1.5 \cdot t_{GL} \cdot d_B \cdot f_{y,k} / \gamma_{M1}$
 t_{GL} = thickness of gusset plate according to Annex 3
 d_B = pin diameter according to Annex 3
 $f_{y,k}$ = characteristic value of the yield strength of the gusset plate material according to $R_{p0,2}$ given in Annex 2
 $\gamma_{M1} = 1.10$
 $\gamma_{M2} = 1.25$

The values given for the partial safety factors γ_{M1} and γ_{M2} are recommended values. They should be used in cases where no values are given in national regulations of the Member State where the tension rod system is used or in the respective National Annex to Eurocode 3 (EN 1993).

2.1.3.2 Design compression resistance of the fork end connectors

The design compression resistance of the fork end connectors used for the connection to compression bars is at least equal to the tension resistance $N_{Rd, Tension Rod}$ of the tension rods according to section 2.1.3.1.

2.1.4 Safety in case of fire

The tension rod system is considered to satisfy the requirements of performance class A1 of the characteristic reaction to fire according to EN 13501-1:2007.

2.2 Methods of verification

2.2.1 General

The assessment of fitness of the tension rod system for the intended use in relation to the requirements for mechanical resistance and stability, safety in case of fire and safety in use in the sense of the essential requirements No. 1, No. 2 and No. 4 has been made in accordance with sections 2.2.2 and 2.2.3.

2.2.2 Essential requirement No. 2: Safety in case of fire

The tension rod system is considered to satisfy the requirements of performance class A 1 of the characteristic reaction to fire, in accordance with the provisions of EC Decision 96/603/EC (as amended) without the need for testing on the basis of its listing in that decision.

2.2.3 Essential requirement No. 1: Mechanical resistance and stability Essential requirement No. 4: Safety in use

In order to verify that the tension resistance of the fork end connectors is higher than the tension resistance of the corresponding tension rods made of steel grade S460N and thus not relevant to the resistance of the entire tension rod system, the characteristic values of the tension resistance of the fork end connectors were assessed by the evaluation of the results of tension tests.

Tension tests were carried out on four system sizes of the fork end connectors. The characteristic values of the tension resistance of the fork end connectors were determined by evaluating the test results of 3 tension tests carried out on each of the fork end connectors M 16, M 36, M 48 and M 100.

Comparison of characteristic values of resistance of the corresponding tension rods, gusset plates, couplers and adapters calculated according to EN 1993-1-1:2005 and EN 1993-1-8:2005 with the statistically evaluated test results (characteristic values) has shown that the tension resistance of the fork end connectors (including pins) as well as the tension resistance of the couplers is not relevant to the tension resistance of the entire tension rod system. The tension resistance of the adapters is at least identical to the tension resistance of the tension rods. Thus it is sufficient to calculate only the tension resistance of the tension rods and the bearing resistance of the gusset plates in order to determine the tension resistance of the entire tension rod system.

Due to the fact that the compression and tension resistance of the fork end connectors are identical the compression resistance of the fork end connectors is at least equal to the tension resistance of the tension rods.

3 Evaluation and attestation of conformity and CE marking

3.1 System of attestation of conformity

According to the Decision 98/215/EC of the European Commission⁸ system 2+ of the attestation of conformity applies.

This system of attestation of conformity is defined as follows:

System 2+: Declaration of conformity of the product by the manufacturer on the basis of:

- (a) Tasks for the manufacturer:
 - (1) initial type-testing of the product;
 - (2) factory production control;
 - (3) testing of samples taken at the factory in accordance with a prescribed test plan.
- (b) Tasks for the approved body:
 - (4) certification of factory production control on the basis of:
 - initial inspection of factory and of factory production control;
 - continuous surveillance, assessment and approval of factory production control.

Note: Approved bodies are also referred to as "notified bodies".

⁸ Official Journal of the European Communities L 80 of 18.03.1998

3.2 Responsibilities

3.2.1 Tasks for the manufacturer

3.2.1.1 Factory production control

The manufacturer shall exercise permanent internal control of production. All the elements, requirements and provisions adopted by the manufacturer shall be documented in a systematic manner in the form of written policies and procedures, including records of results performed. This production control system shall insure that the product is in conformity with this European technical approval.

The manufacturer may only use initial materials stated in the technical documentation of this European technical approval.

The factory production control shall be in accordance with the control plan which is part of the technical documentation of this European technical approval. The control plan is laid down in the context of the factory production control system operated by the manufacturer and deposited with Deutsches Institut für Bautechnik.⁹

The results of factory production control shall be recorded and evaluated in accordance with the provisions of the control plan.

3.2.1.2 Other tasks for the manufacturer

The manufacturer shall, on the basis of a contract, involve a body which is approved for the tasks referred to in section 3.1 in the field of "Tension Rod Systems" in order to undertake the actions laid down in section 3.2.2. For this purpose, the control plan referred to in sections 3.2.1.1 and 3.2.2 shall be handed over by the manufacturer to the approved body involved.

The manufacturer shall make a declaration of conformity, stating that the construction product is in conformity with the provisions of this European technical approval.

3.2.2 Tasks for the approved bodies

The approved body shall perform the

- initial inspection of factory and of factory production control,
- continuous surveillance, assessment and approval of factory production control

in accordance with the provisions laid down in the control plan.

The approved body shall retain the essential points of its actions referred to above and state the results obtained and conclusions drawn in a written report.

The approved certification body involved by the manufacturer shall issue an EC certificate of conformity of the factory production control stating the conformity with the provisions of this European technical approval.

In cases where the provisions of the European technical approval and its control plan are no longer fulfilled the certification body shall withdraw the certificate of conformity and inform Deutsches Institut für Bautechnik without delay.

⁹ The control plan is a confidential part of the European technical approval and only handed over to the approved body involved in the procedure of attestation of conformity. See section 3.2.2.

3.3 CE marking

The CE marking shall be affixed on each packaging of the tension rod system. The letters "CE" shall be followed by the identification number of the approved certification body, where relevant, and be accompanied by the following additional information:

- the name and address of the producer (legal entity responsible for the manufacture),
- the last two digits of the year in which the CE marking was affixed,
- the number of the EC certificate for the factory production control,
- the number of the European technical approval,
- the name of the product,
- the system size and type (e.g., M 100).

4 Assumptions under which the fitness of the product for the intended use was favourably assessed

4.1 Manufacturing

The European technical approval is issued for the product on the basis of agreed data/information, deposited with Deutsches Institut für Bautechnik, which identifies the product that has been assessed and judged. Changes to the product or production process, which could result in this deposited data/information being incorrect, should be notified to Deutsches Institut für Bautechnik before the changes are introduced. Deutsches Institut für Bautechnik will decide whether or not such changes affect the approval and consequently the validity of the CE marking on the basis of the approval and if so whether further assessment or alterations to the approval shall be necessary.

4.2 Design

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

The loading is predominantly static.

Dimensions, material properties and screw-in lengths "ET" as stated in the ETA are observed.

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 in section 2.1 are used for design.

The rules given in EN 1090-2:2008, EN ISO 10684:2004 and EN ISO 12944 are taken into account.

Design is carried out by the designer of the structure experienced in the field of steel structures.

4.3 Installation

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

The installation is carried out such that the tension rod system is 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 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 of fork end connectors may not be adjusted by hammer blows).

The minimum screw-in lengths are marked in an appropriate way. The keeping of the minimum screw-in lengths "ET" given in Annexes 3 to 6 is checked by the assembler. How to do this is described in the assembly instructions.

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

5 Indications to the manufacturer

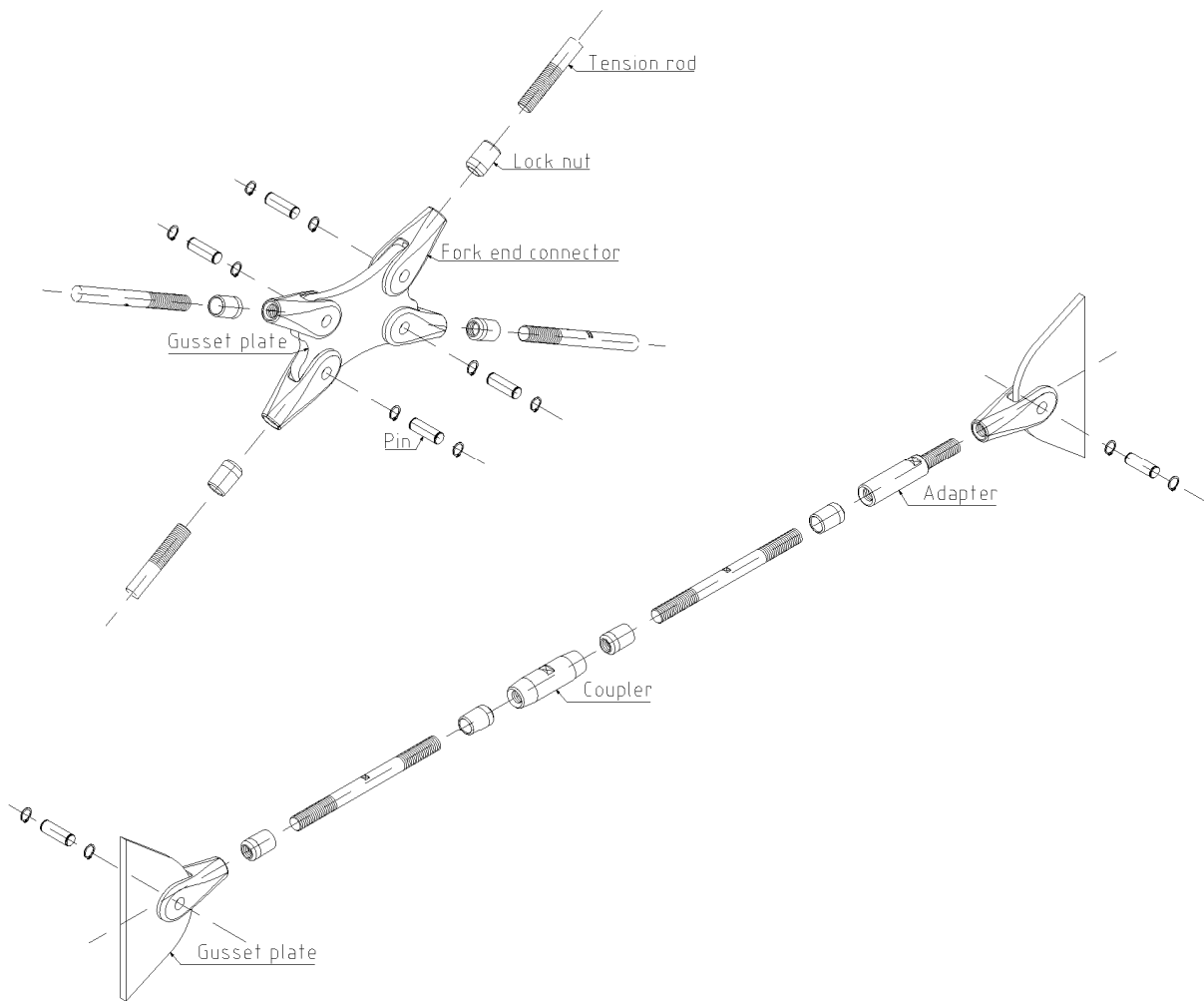
The manufacturer shall ensure that the information on the specific conditions according to sections 1, 2, 4.2 and 4.3 (including Annexes referred to) is given to those who are concerned. This information may be given by reproduction of the European technical approval.

In addition all essential installation data (e.g., minimum screw-in length "ET" according to Annexes 3 to 6) shall be shown clearly on the package and/or on an enclosed instruction sheet, preferably using illustration(s).

The prefabricated tension rod system shall be packaged and delivered as a complete unit only (tension rods, fork end connectors incl. pins, couplers, adapters and prefabricated gusset plates). The fork end connectors used for the connection to compression bars may also be delivered separately.

Andreas Kummerow
p. p. Head of Department

beglaubigt:
Spohn

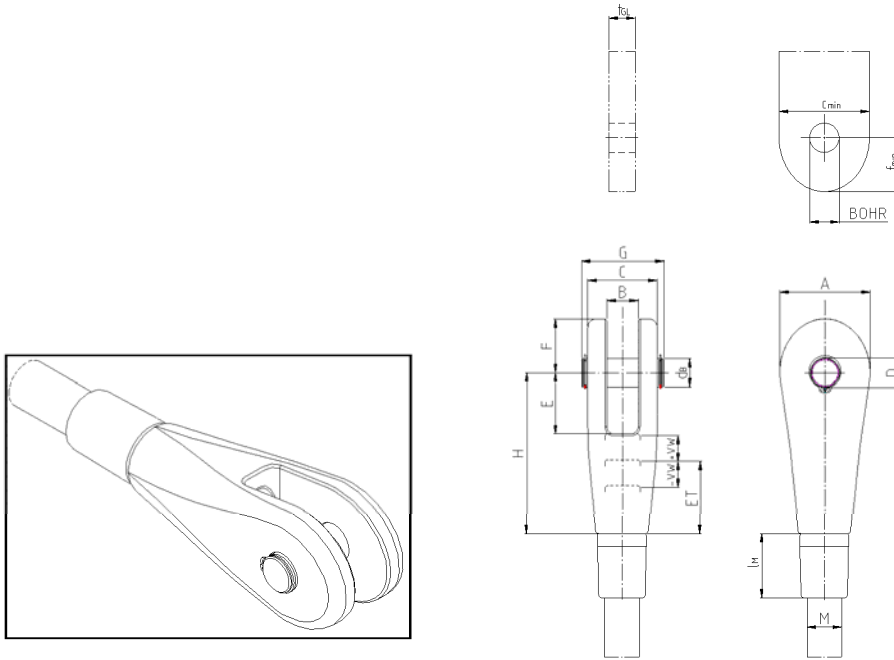


Pfeifer Tension Rod System 860

System, components

Annex 1

Component	Steel grade / material	Yield strength	Tensile strength	Elongation	Charpy impact energy
		Minimum values			
		$R_{p0.2}$ [N/mm ²]	R_m [N/mm ²]	A_5 [%]	[J/°C] (ISO-V)
Fork end connector according to Annex 3	EN-GJS-400-18-LT	according to EN 1563			
Tension rod according to Annex 4	S460N	460	625	17	27/-20
Pin according to Annex 3	34CrNiMo 6+QT	according to EN 10083-3			27/-20
Lock nut according to Annex 3	S355J2	according to EN 10025-2			
Individually fabricated gusset plate according to Annex 3	S355J2 S235J2	according to EN 10025-2			
Adapter M10 to M64 according to Annex 4	S460N	460	625	17	27/-20
Adapter M70 to M100 according to Annex 4	34CrNiMo 6+QT	according to EN 10083-3			27/-20
Coupler according to Annex 3	S355J2	according to EN 10025-2			
Prefabricated gusset plate according to Annex 5	S355J2	according to EN 10025-2			
Intersection coupler M12 bis M36 according to Annex 5	S460N	460	625	17	27/-20
Connector M10 bis M70 according to Annex 6	S460N	460	625	17	27/-20
Connector M80 bis M100 according to Annex 6	34CrNiMo 6+QT	according to EN 10083-3			27/-20
Pfeifer Tension Rod System 860					Annex 2
Material properties of components					

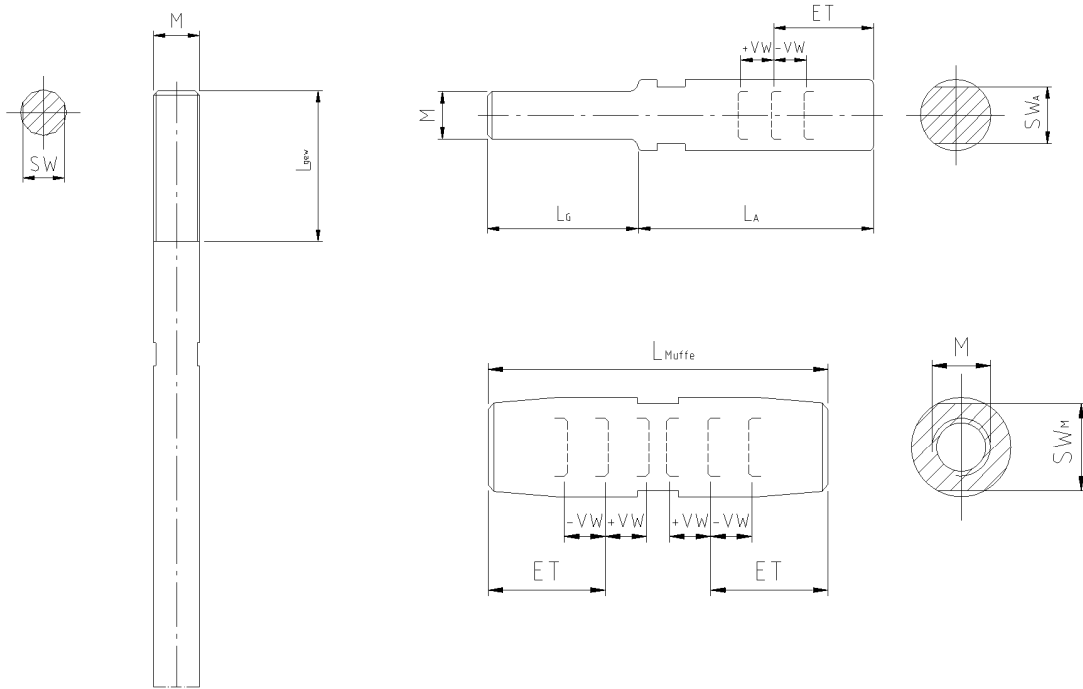


Fork end connector EN-GJS-400-18-LT											Pin 34 CrNiMo 6+QT		Lock nut S355J2	Gusset plate S355J2 S235J2			
Size	M	A	B	C	D	E	F	H	ET	±VW	dB	G	l _M	t _{GL}	f _{min}	c _{min}	BOHR
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
M 10	10	25	10	20	10	19	16	52	20	7	9	27.0	21	8	16	25	10
M 12	12	29	12	24	11	21	18	58	22	6	10	31.0	25	10	17	29	11
M 16	16	42	15	32	15	30	26	77	34	12	14	41.0	33	12	23	42	15
M 20	20	52	18	40	17	35	31	93	42	15	16	50.2	41	15	27	52	17
M 24	24	58	23	48	23	46	39	115	50	18	22	59.8	49	20	36	58	23
M 27	27	68	23	54	25	47	44	125	56	20	24	66.6	55	20	39	68	25
M 30	30	77	28	60	29	52	51	138	62	22	28	74.8	62	25	47	77	30
M 36	36	90	28	72	33	64	58	167	74	26	32	89.3	74	25	53	90	34
M 42	42	104	33	84	37	70	66	190	87	31	36	103.5	86	30	59	104	38
M 48	48	120	38	96	41	78	74	213	99	34	40	118.7	99	35	66	120	42
M 52	52	136	43	104	46	85	84	231	106	37	45	126.7	107	40	73	136	47
M 56	56	148	43	112	51	95	91	254	116	41	50	138.3	115	40	81	148	52
M 60	60	162	48	120	56	106	100	275	123	43	55	146.3	124	45	90	162	58
M 64	64	170	53	128	56	107	103	286	131	45	55	154.8	132	50	90	170	58
M 70	70	185	58	140	61	117	113	315	144	51	60	166.8	144	55	98	185	63
M 80	80	210	68	160	71	133	132	359	164	58	70	187.8	165	65	114	210	73
M 90	90	240	78	180	80	150	150	402	184	64	79	211.5	185	75	128	240	82
M 100	100	265	83	200	90	170	165	448	204	71	89	232.5	205	80	144	265	92

Pfeifer Tension Rod System 860

Fork end connector, pin, lock nut, gusset plate

Annex 3

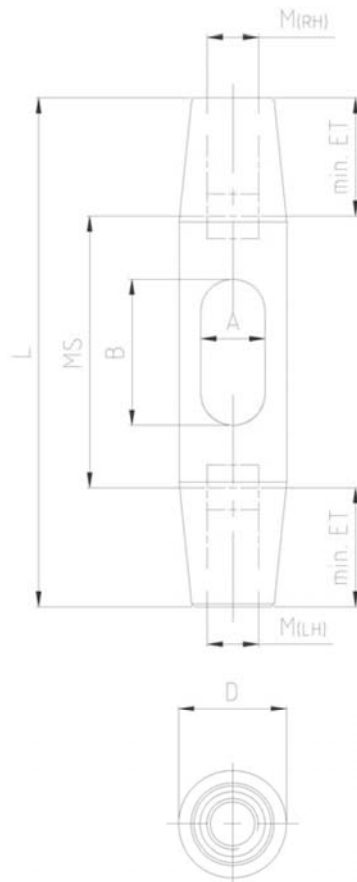


Size	Tension rod			Adapter					Coupler			
	M	L _{gew}	SW	S460N 34CrNiMo 6+QT					S355J2			
	mm	mm	mm	L _G	L _A	SW _A	ET	± VW	L _{Muffe}	SW _M	ET	± VW
				mm	mm	mm	mm	mm	mm	mm	mm	mm
M 10	10	33	9	31	50	12	20	7	58	15	20	7
M 12	12	39	10	36	60	14	22	6	72	17	22	6
M 16	16	54	14	50	80	19	34	12	94	24	34	12
M 20	20	67	18	62	100	24	42	15	116	30	42	15
M 24	24	80	22	74	115	30	50	18	138	36	50	18
M 27	27	90	25	83	130	32	56	20	156	41	56	20
M 30	30	100	28	92	140	36	62	22	172	46	62	22
M 36	36	120	33	110	170	46	74	26	207	55	74	26
M 42	42	140	39	128	195	50	87	31	242	65	87	31
M 48	48	159	45	145	220	60	99	34	273	75	99	34
M 52	52	172	-	156	240	65	106	37	295	80	106	37
M 56	56	187	-	170	255	70	116	41	321	85	116	41
M 60	60	199	-	180	275	75	123	43	341	90	123	43
M 64	64	211	-	191	295	80	131	45	362	95	131	45
M 70	70	233	-	210	325	90	144	51	400	110	144	51
M 80	80	266	-	238	375	105	164	58	456	125	164	58
M 90	90	297	-	264	425	115	184	64	508	140	184	64
M 100	100	328	-	290	450	130	204	71	560	155	204	71

Pfeifer Tension Rod System 860

Tension rod, adapter, coupler

Annex 4

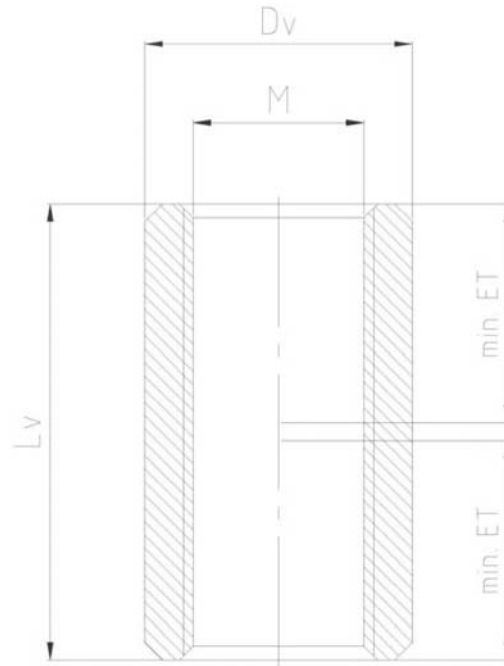


Intersection coupler								
S460N								
Size	M mm	L mm	D mm	MS mm	min. ET mm	A mm	B mm	± VW mm
M 12	12	121	27	77	12	16.5	39.0	12
M 16	16	165	36	97	16	20.5	48.5	24
M 20	20	200	42	114	20	25.0	57.0	30
M 24	24	238	48	137	24	28.5	70.5	36
M 27	27	262	52	148	27	32.0	77.0	40
M 30	30	285	60	162	30	35.0	84.0	44
M 36	36	329	70	180	36	41.0	97.0	52

Pfeifer Tension Rod System 860

Intersection coupler

Annex 5



Connector

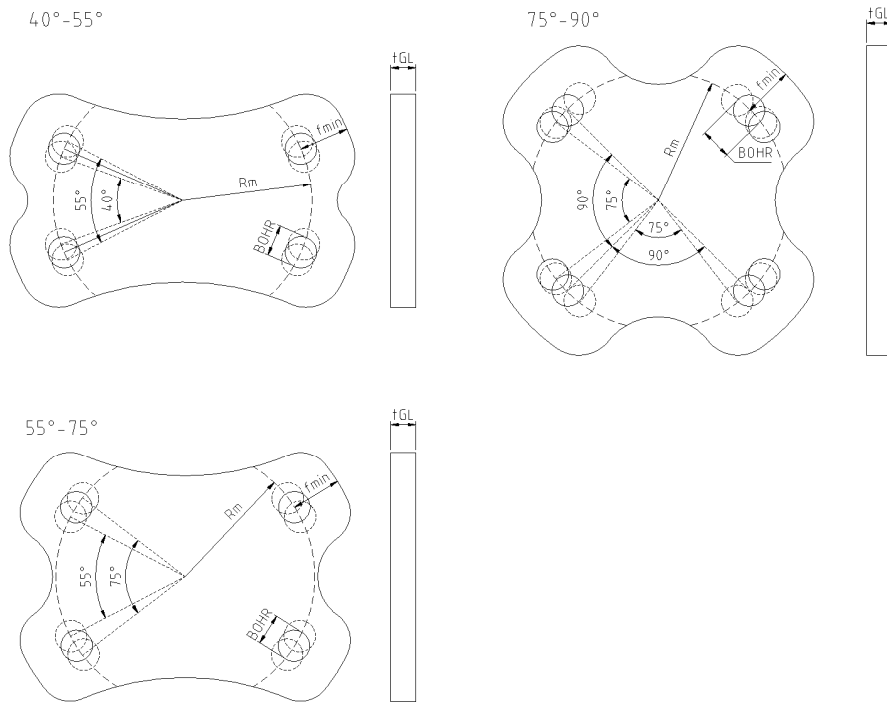
S460
34CrNiMo 6+QT

Size	D mm	M mm	L mm	min. ET mm
M 10	16	10	24	10
M 12	20	12	30	12
M 16	24	16	40	16
M 20	30	20	48	20
M 24	36	24	58	24
M 27	42	27	66	27
M 30	42	30	72	30
M 36	52	36	88	36
M 42	60	42	102	42
M 48	70	48	116	48
M 52	80	52	126	52
M 56	80	56	136	56
M 60	90	60	144	60
M 64	90	64	154	64
M 70	100	70	168	70
M 80	110	80	192	80
M 90	120	90	216	90
M 100	130	100	240	100

Pfeifer Tension Rod System 860

Connector

Annex 6



		Gusset plate 40°-55° S355J2		Gusset plate 55°-75° S355J2		Gusset plate 75°-90° S355J2		
Size	t _{GL} mm	BOHR mm	f _{min} mm	R _m mm	f _{min} mm	R _m mm	f _{min} mm	R _m mm
M 10	8	10	16	41	16	41	16	41
M 12	10	11	17	53	17	53	17	53
M 16	12	15	23	71	23	71	23	71
M 20	15	17	27	86	27	86	27	86
M 24	20	23	36	99	36	99	36	99
M 27	20	25	39	114	39	114	39	114
M 30	25	30	47	131	47	131	47	131
M 36	25	34	53	153	53	153	53	153
M 42	30	38	59	171	59	171	59	171
M 48	35	42	66	194	66	194	66	194
M 52	40	47	73	219	73	219	73	219
M 56	40	52	81	236	81	236	81	236
M 60	45	58	90	260	90	260	90	260
M 64	50	58	90	283	90	283	90	283
M 70	55	63	98	313	98	313	98	313
M 80	65	73	114	352	114	352	114	352
M 90	75	82	128	390	128	390	128	390
M 100	80	92	144	425	144	425	144	425

Pfeifer Tension Rod System 860

Prefabricated gusset plate

Annex 7