Deutsches Institut für Bautechnik
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Authorised and notified according to Article 10 of the Council Directive of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products (89/106/EEC)

Deutsches Institut für Bautechnik
DIBt

Mitglied der EOTA
Member of EOTA

European Technical Approval ETA-11/0160

English translation prepared by DIBt - Original version in German language

Handelsbezeichnung *Trade name*	PFEIFER Seil-Zugglieder *PFEIFER Wire Ropes*
Zulassungsinhaber *Holder of approval*	Pfeifer Seil- und Hebetechnik GmbH Dr.-Karl-Lenz-Str. 66 87700 Memmingen DEUTSCHLAND
Zulassungsgegenstand und Verwendungszweck *Generic type and use of construction product*	Vorgefertigte Seile aus unlegierten und nichtrostenden Stählen mit Endverankerungen *Prefabricated unalloyed steel and stainless steel wire ropes with end connectors*
Geltungsdauer: *Validity:*	vom *from* 5 August 2011 bis *to* 5 August 2016
Herstellwerk *Manufacturing plant*	Pfeifer Seil- und Hebetechnik GmbH Dr.-Karl-Lenz-Str. 66 87700 Memmingen DEUTSCHLAND

Diese Zulassung umfasst *This Approval contains*	39 Seiten einschließlich 30 Anhänge *39 pages including 30 annexes*

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 products[1], modified by Council Directive 93/68/EEC[2] and Regulation (EC) N° 1882/2003 of the European Parliament and of the Council[3];
- 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 1998[4], as amended by law of 31 October 2006[5];
- Common Procedural Rules for Requesting, Preparing and the Granting of European technical approvals set out in the Annex to Commission Decision 94/23/EC[6].

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 2006*, p. 2407, 2416
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 products are prefabricated high-strength unalloyed and stainless steel wire ropes with trade name "PFEIFER Wire Ropes".

The prefabricated high-strength wire ropes made of unalloyed steel consist of full locked coil cables (PV) or open spiral strands (PG) or structural wire ropes as well as the appropriate end connectors (see Annexes 1.1 and 1.2), connecting components, guides and clamps. The wire ropes made of unalloyed steel can also be used in combination with fork connector Type 860 according to ETA-04/0039.

The prefabricated high-strength wire ropes made of stainless steel consist of open spiral strands (PE) or structural wire ropes as well as the appropriate end connectors (see Annex 1.3), connecting components, guides and clamps.

1.2 Intended use

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

The wire ropes with end connectors are intended for the use in structures with predominantly static loads only.

The installed wire ropes with end connectors shall be accessible in order to facilitate replacement of individual components at any time.

The provisions made in this European technical approval are based on an assumed working life of the prefabricated wire ropes with end connectors 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 product and methods of verification

2.1 Characteristics of the product

2.1.1 General

The material indications, dimensions and tolerances which are not stated in the Annexes shall correspond to the information given in the technical documentation[7] to this European technical approval.

2.1.2 Wire ropes

For the prefabricated high-strength wire ropes made of unalloyed steel the indications given in EN 10264-3 as well as in the series of the standards EN 12385 shall apply. In addition the indications given in sections 2.1.3, 2.1.4.1 and 2.1.9 as well as in Annexes 2.2.1, 3, 6.1, 7.1, 8.1, 9.1, 9.3, 10.1 and 11.1 shall be taken into account.

[7] The technical documentation of this European technical approval is deposited with Deutsches Institut für Bautechnik and, as far as this is important for the tasks of the bodies involved in the procedure of attestation of conformity, shall be handed over to the approved bodies.

For the prefabricated high-strength wire ropes made of stainless steel the indications given in EN 10264-4 as well as in the series of the standards EN 12385 shall apply. In addition the indications given in sections 2.1.4.2 and 2.1.9 as well as in Annexes 2.1.2, 6.2, 7.2, 8.2, 9.2, 9.4, 10.2 and 11.2 shall be taken into account.

2.1.3 Sockets for unalloyed steel wire ropes

For the material properties of the sockets the indications given in Annexes 2.1.1 and 5 shall apply. The inner and outer quality of the sockets made of steel castings shall correspond to grades SM2, LM2 and AM2 according to EN 1369:1996 as well as to grade 2 according to EN 12680-1:2003.

The grout shall correspond to the indications given in Annex 3.

For the geometric design of the sockets the indications given in Annexes 3 to 5 respectively given in the technical documentation[7] shall apply. Sockets with thread shall have metric ISO threads in accordance with the technical documentation[7].

The sockets shown in Annexes 3 to 5 may be used for open spiral strands and full locked spiral strands with cable diameters from 20 mm to 160 mm (also see Annexes 2.2.1 and 3).

Below the lock nut of the open bridge socket Type 804 washers according to EN ISO 7089-200HV-tzn shall be arranged. For undeliverable sizes washers shall be made of steel 34CrNiMo6+QT.

2.1.4 Swaged end connectors (open sockets, closed sockets and fittings with thread)

2.1.4.1 Unalloyed steel wire ropes

For the material properties of the open sockets, closed sockets and fittings with thread as well as the turnbuckles the indications given in Annexes 2.1.1, 6.1, 7.1, 8.1, 9.1, 9.3, 10.1 and 11.1 shall apply. The inner and outer quality of the open sockets of spheroidal graphite cast iron shown in Annex 9.1 shall correspond to the grades SM2, LM2 and AM2 according to EN 1369:1996 as well as to the grade 2 according to the EN 12680-3:2003.

The dimensions shall correspond to the indications given in Annexes 6.1, 7.1, 8.1, 9.1, 9.3, 10.1 and 11.1. The swaged fittings with thread and open swaged sockets as well as the turnbuckles shown in Annexes 8.1, 9.1, 9.3 and 11.1 shall have metric ISO threads in accordance with the technical documentation[7].

The fittings and turnbuckles shown in Annexes 6.1, 7.1, 8.1, 9.1, 9.3, 10.1 and 11.1 may be used for open spiral strands and the fittings shown in Annexes 6.1, 7.1 and 8.1 may be used for structural wire ropes with cable diameters from 3 mm to 36 mm respectively from 8.1 mm to 36.3 mm (also see Annexes 2.2.1, 6.1, 7.1, 8.1, 9.1, 9.3, 10.1 and 11.1).

2.1.4.2 Stainless steel wire ropes

For the material properties of the open sockets, closed sockets and fittings with thread as well as the turnbuckles the indications given in Annexes 2.1.2, 6.2, 7.2, 8.2, 9.2, 9.4, 10.2 and 11.2 shall apply.

The dimensions shall correspond to the indications given in Annexes 6.2, 7.2, 8.2, 9.2, 9.4, 10.2 and 11.2. The swaged fittings with thread as well as the turnbuckles shown in Annexes 8.2, 9.4 and 11.2 shall have metric ISO threads in accordance with the technical documentation[7].

The fittings and turnbuckles shown in Annexes 6.2, 7.2, 8.2, 9.2, 9.4, 10.2 and 11.2 may be used for open spiral strands and the fittings shown in Annexes 6.2, 7.2 and 8.2 may be used for structural wire ropes with cable diameters from 3 mm to 36 mm respectively from 6.1 mm to 36.6 mm (also see Annexes 2.2.2, 6.2, 7.2, 8.2, 9.2, 9.4, 10.2 and 11.2).

2.1.5 Pins for fork end connectors and open spelter sockets

The indications given in Annexes 2.1.1, 5, 6.1 and 9.1 shall apply for wire ropes made of unalloyed steel respectively in Annexes 2.1.2, 6.2 and 9.2 for wire ropes made of stainless steel.

2.1.6 Connecting components, guides and clamps

The connecting components, guides and clamps for the wire ropes made of unalloyed steel laid down in this European technical approval are intended for open spiral strands and full locked coil cables with cable diameters from 20 mm to 160 mm and are manufactured of steel castings in accordance with the indications given in Annex 2.1.1.

The connecting components, guides and clamps for the wire ropes made of stainless steel laid down in this European technical approval are manufactured of stainless steels with material numbers 1.4462, 1.4401 and 1.4571 in the strength class S460.

2.1.7 Characteristic and design values of tension resistance

2.1.7.1 Characteristic and design values of tension resistance of the wire ropes with end connectors

The characteristic values of the tension resistance $Z_{R,k}$ as well as the values of the design tension resistance $Z_{R,d}$ of the wire rope systems PV, PG and PE for tension resistances of the wire ropes of min. $f_{u,k}$ = 1570 N/mm² respectively $f_{u,k}$ = 1770 N/mm² respectively $f_{u,k}$ = 1450 N/mm² are given in Annexes 12.1 to 12.3. These values apply for the wire ropes including the corresponding end connectors.

The characteristic and design values of the tension resistances $Z_{R,k}$ and $Z_{R,d}$ of the other wire ropes with end connectors shall be determined as follows:

$Z_{R,k} = A_m \cdot f_{u,k} \cdot k_s \cdot k_e$

$Z_{R,d} = Z_{R,k}/(1.5 \cdot \gamma_M)$

where:

A_m: metallic cross section of the wire ropes

$A_m = \pi \cdot d^2/4 \cdot f$

where: d = rope diameter

f = bulk factor according to Annexes 2.2.1 and 2.2.2

$f_{u,k}$: characteristic value of tension resistance of the wire ropes

k_s, k_e: strand factor, loss factor according to Annexes 2.2.1 and 2.2.2

γ_M: partial safety factor

As characteristic value $f_{u,k}$ of unalloyed steel wire ropes $f_{u,k} \leq$ 1770 N/mm² shall be used. For stainless steel wire ropes the minimum values of R_m indicated in Annex 2.1.2 shall be used.

As partial safety factor γ_M the value 1.1 is recommended. It should be used in cases where no values are given in the national regulations of the Member State where the wire ropes with end connectors are used or in the respective National Annex to Eurocode 3.

In case of wire ropes with fittings shown in Annexes 6.1 and 8.2 the values of the characteristic and design tension resistances $Z_{R,k}$ and $Z_{R,d}$ apply in each case for the wire ropes including corresponding fittings.

2.1.7.2 Resistance of the connection of the sockets with the corresponding connecting components

The resistance of the connection of the sockets with the corresponding connecting components shall be verified in each case. Annexes 4.1 to 4.3 show typical examples for connecting components. For the determination of the resistances the rules given in EN 1993-1-8[8] shall apply. Concerning the thread engagement ET of sockets with metric ISO thread Annexes 4.2 and 4.3 shall be taken into account.

In case of open spelter sockets PV Type 802 according to Annex 5 the resistance of the **bolts** is already covered by the tension resistances $Z_{R,k}$ and $Z_{R,d}$ according to Annex 12.1, provided that the thickness of the connecting plate corresponds to the indications given in Annex 5.

[8] In addition the corresponding National Annex and/or the national provisions of the Member State applicable for the location where the product is incorporated in the works shall be taken into account.

2.1.7.3 Resistance of the connection of the fittings with the corresponding connecting components

The resistance of the connecting components intended for the fittings shown in Annexes 6.1 to 11.2 (connecting plates, bolts, etc.) shall be verified in each case. For the determination of the resistance EN 1993-1-8[8] shall apply.

In case of open swaged fittings described in Annexes 9.1 and 9.2 the resistance of the **bolts and connecting plates** is already covered by the tension resistances $Z_{R,k}$ and $Z_{R,d}$ according to Annexes 12.2 and 12.3, provided that the dimensions of the connecting plates correspond to the indications given in Annexes 9.1 and 9.2.

In case of open swaged fittings described in Annexes 6.1 and 6.2 the resistance of the **bolts** is already covered by the tension resistances $Z_{R,k}$ and $Z_{R,d}$ according to section 2.1.7.1, provided that the dimensions of the connecting plates correspond to the indications given in Annexes 6.1 and 6.2.

The verification of replacement of pins and connecting plates of the wire ropes shall be carried out according to EN 1993-1-8[8].

2.1.8 Safety in case of fire

The prefabricated wire ropes with end connectors are considered to satisfy the requirements of performance class A1 of the characteristic reaction to fire according to EN 13501-1:2007.

2.1.9 Durability

The rules given in EN 1993-1-11[8], section 4 shall be taken into account.

For sockets EN 13411-4 applies.

2.2 Methods of verification

2.2.1 General

The assessment of fitness of the prefabricated unalloyed steel and stainless steel wire ropes with end connectors for the intended use in relation to the requirements for mechanical resistance and stability and safety in case of fire in the sense of the essential requirements No. 1 and No. 2 has been made in accordance with sections 2.2.2 and 2.2.3.

2.2.2 Essential requirement No. 1: Mechanical resistance and stability

The values for k_e were determined on the basis of the evaluation of tensile tests on wire ropes with end connectors.

The values for the modulus of elasticity E_Q are reference values. They correspond to the values given in EN 1993-1-11.

The values for the bulk factor f correspond to EN 1993-1-11 respectively indications of the manufacturer.

The values for k_s are based on indications of the manufacturer.

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

The wire ropes with end connectors are considered to satisfy the requirements of performance class A1 according to EN 13501-1:2007 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.

3 Evaluation and attestation of conformity and CE marking

3.1 System of attestation of conformity

According to the communication of the European Commission[9] 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".

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 of 5 August 2011 relating to the European technical approval ETA-11/0160 issued on 5 August 2011 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.[10]

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 "Prefabricated wire ropes with end connectors" 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 the European technical approval ETA-11/0160 issued on 5 August 2011.

[9] Letter of the European Commission of 16/01/2009 to EOTA

[10] 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.

3.2.2 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.

3.3 CE marking

The CE marking shall be affixed on each packaging of the wire ropes with end connectors. 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 type or name of the product.

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 Installation

The installation is carried out such that the wire ropes with end connectors 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.

By installing the open bridge socket Type 804 attention is paid on accurate symmetric arrangement of thread and eye bar to avoid eccentric loading of the sleeve.

The thread engagements according to Annexes 4.2, 4.3, 8.1 and 11.1 respectively 8.2 and 11.2 are taken into account.

The responsible assembler confirms that all connections with threads were checked concerning compliance with the minimum thread engagements.

The conformity of the connecting components and the installed wire ropes with end connectors with the provisions of this European technical approval is confirmed by the executing assembler.

4.3 Design

The design is carried out according to EN 1993-1-11[8] taking into account the provisions of this European technical approval.

The characteristic and design values of resistance given in section 2.1.7 are used for design.

The loading is predominantly static.

The dimensions, tolerances, material properties and thread engagements stated in this European technical approval are observed.

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

5 Indications to the manufacturer

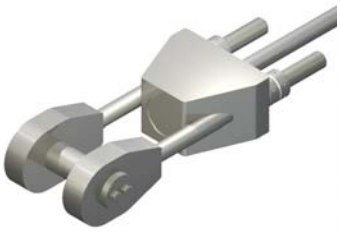
The manufacturer shall ensure that the information on the specific conditions according to sections 1, 2, 4.2 and 4.3 (including Annexes referred to) is given to those who are concerned. This information may be given by reproduction of the European technical approval.

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

The wire ropes with end connectors shall be packaged and delivered as a complete unit only.

Dr.-Ing. Karsten Kathage
Vice-President

beglaubigt:
Spohn

PV			
	Konische Vergusshülse mit Innengewinde Typ 800 **Conical socket with internal thread Type 800**	**Zylindrische Vergusshülse mit Innengewinde Typ 801** **Cylindrical socket with internal tread Type 801**	**Gabelseilhülse mit Bolzen Typ 802** **Open spelter socket with pin Type 802**
PV			
	Vergusshülse mit Augenstab Typ 804 **Open bridge socket Type 804**	**Zylindrische Vergusshülse mit Innen- und Außengewinde Typ 810*** **Cylindrical socket with internal and external thread Type 810***	**Zylindrische Vergusshülse Typ 811** **Cylindrical socket Type 811**
PV			
	Zylindrische Vergusshülse mit Außengewinde Typ 812* **Cylindrical socket with external thread Type 812***	**Konische Vergusshülse-Gabelkopf Typ 864** **Conical socket-fork connector Type 864**	
	* Darstellung mit sphärischer Mutter/sphärischer Scheibe Typ 813/814 * Exposure with spherical nut/spherical disc Type 813/814		

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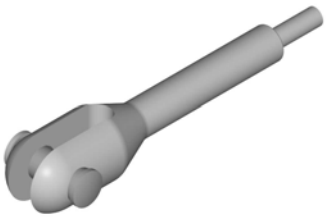
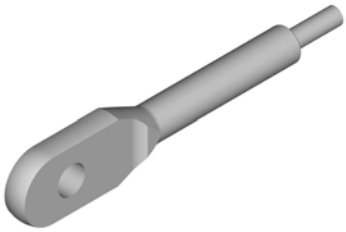
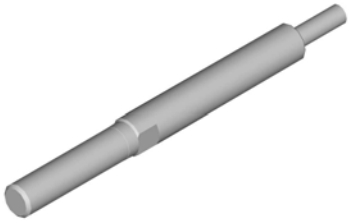
Seil-Zugglieder
Endverankerungen
Übersicht

Wire ropes
End connectors
Overview

Anhang 1.1
Annex 1.1
zur europäischen technischen Zulassung
to European technical approval

ETA-11/0160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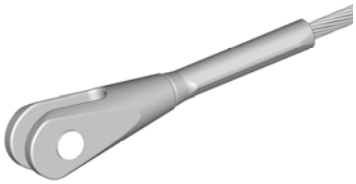
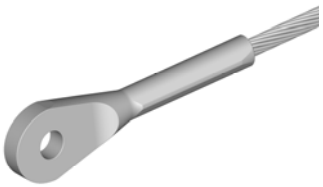
PG			
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PG			
	Gewindefitting **Typ 988** **Swaged fitting with thread** **Type 988**		

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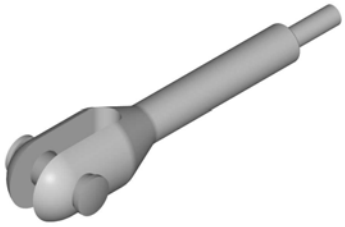
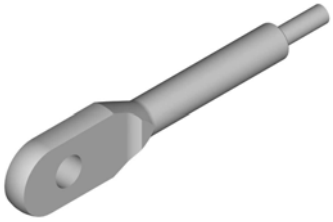
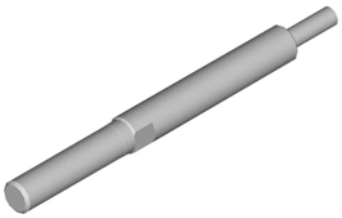
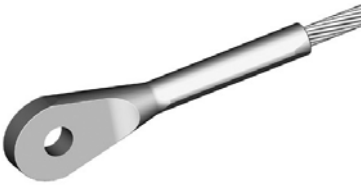
Seil-Zugglieder
Endverankerungen
Übersicht

Wire ropes
End connectors
Overview

Anhang 1.2
Annex 1.2
zur europäischen technischen Zulassung
to European technical approval

ETA-11/0160

			
	Gabelfitting **Typ 961** **Open swaged fitting** **Type 961**	**Ösenfitting** **Typ 963** **Closed swaged fitting** **Type 963**	**Gewindefitting** **Typ 969** **Swaged fitting with thread** **Type 969**
PE			
	Gabelfitting **Typ 981** **Open swaged fitting** **Type 981**	**Ösenfitting** **Typ 983** **Closed swaged fitting** **Type 983**	**Gabelspannschloss** **Typ 985** **Turnbuckle with open socket Type 985**
PE			
	Gewindefitting **Typ 989** **Swaged fitting with thread** **Type 989**		

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Seil-Zugglieder
Endverankerungen
Übersicht

Wire ropes
End connectors
Overview

Anhang 1.3
Annex 1.3
zur europäischen technischen Zulassung
to European technical approval

ETA-11/0160

Tabelle 1.1 – Stahlsorten, mechanische Eigenschaften (Mindestwerte)
Table 1.1 – Steel grade, mechanical properties (minimum values)

Bauteile für die Endverankerungen Components of end connectors	**Stahlsorte Steel grade**		**Mechanische Eigenschaften (Mindestwerte) Mechanical properties (minimum values)**				
	Kurzname Symbol	Werkstoff-Nr. Material-No.	Erzeugnisdicke Thickness t in mm	Streckgrenze Yield strength $R_{p0,2}$ in N/mm²	Zugfestigkeit Tensile strength R_m in N/mm²	Bruchdehnung Elongation A_5 in %	Kerbschlagarbeit Impact strength α_k in J/°C (ISO-V)
Vergusshülse / Socket Klemme / Clamp Umlenklager / Guide	G18NiMoCr3-6	1.6759	gemäß EN 10340 / according to EN 10340				≥ 27/-40
Bolzen / Pin Vergusshülse / Socket	34CrNiMo6V	1.6582	gemäß EN 10083-3 / according to EN 10083-3				≥ 27/-40
Fitting Typ 980, 982, 988 / Fitting Type 980, 982, 988 Gewindestange Typ 864 / Threaded rod Type 864	S460N	1.8901	-	460	625	17	≥ 27/-20
Fitting Typ 960, 962, 968 / Fitting Type 960, 962, 968 Gewindestange Typ 840 / Threaded rod Type 840 Sphärische Mutter-Scheibe / Spherical nut-disc Typ / Type 813 / 814	S355J2	1.0577	gemäß EN 10025-2 / according to EN 10025-2				
Gabelkopf für Typ 980 / Fork connector for Type 980	EN-GJS-400-18-LT	EN-JS 1025	gemäß EN 1563 / according to EN 1563				

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Tabelle 1.1
Stahlsorten der Bauteile für Seile aus unlegiertem Stahl
Mechanische Eigenschaften (Mindestwerte)

Table 1.1
Steel grade of components for wire ropes of unalloyed steel
Mechanical properties (minimum values)

Anhang 2.1.1
Annex 2.1.1
zur europäischen technischen Zulassung
to European technical approval

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Tabelle 1.2 – Stahlsorten, mechanische Eigenschaften (Mindestwerte)
Table 1.2 – Steel grade, mechanical properties (Minimum values)

Bauteile **Components**	**Stahlsorte** **Steel grade**			**Mechanische Eigenschaften (Mindestwerte)** **Mechanical properties (minimum values)**					
	Kurzname Symbol	Werkstoff-Nr. Material-No	Festigkeitsklasse Strength class	Streckgrenze Yield strength $R_{p0,2}$ in N/mm²	Zugfestigkeit Tensile strength R_m in N/mm²	Bruchdehnung Elongation in %			Temperaturdehnzahl Thermal expansion coefficient α_k in K^{-1}
						A_5	A_{10}	A_{GL}	
Seil / Wire rope	X4CrNiMo 17-13-3	1.4436	S1100	1100	1450	-	6	2	$16x10^{-6}$
	X5CrNiMo 17-12-2	1.4401	S1100	1100	1450	-	6	2	$16x10^{-6}$
Bolzen / Pin	X2CrNiMoN 22-5-3	1.4462	S460	460	600	10	-	-	$13x10^{-6}$
			S690	690	800	12	-	-	$13x10^{-6}$
Gabelfitting Typ 961, 981/ Open swaged fitting Type 961, 981 Ösenfitting Typ 963, 983/ Closed swaged fitting Type 963, 983 Gewindefitting Typ 969, 989/ Swaged fitting with thread Type 969, 989	X2CrNiMoN 22-5-3	1.4462	S460	460	600	10	-	-	$13x10^{-6}$

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Tabelle 1.2
Stahlsorten der Bauteile für Seile aus nichtrostendem Stahl
Mechanische Eigenschaften (Mindestwerte)

Table 1.2
Steel grade of components for wire ropes of stainless steel
Mechanical properties (minimum values)

Anhang 2.1.2
Annex 2.1.2
zur europäischen technischen Zulassung
to European technical approval

ETA-11/0160

Tabelle 2.1 – Verlustfaktoren k_e, Füllfaktor f, Verseilfaktoren k_s
Table 2.1 – Loss factor k_e, bulk factor f, strand factor k_s

Vollverschlossene Seile
Full locked cables

Endverankerung PV alle Typen
End connector PV all types

Seilaufbau Structure of strand		VVS – 1	VVS – 2	VVS – 3	VVS > 3
Füllfaktor f / Bulk factor f		**0,81**	**0,84**	**0,88**	**0,88**
Verseilfaktor k_s / Strand factor k_s		**0,92**			
Verlustfaktor k_e Loss factor k_e	Vergusshülsen mit Metall- u. Kunststoffverguss Sockets with casting in metal and plastic	**1,0**			

Offene Spiralseile
Open spiral strands

Endverankerung PV alle Typen sowie Endverankerung Typ 960, Typ 962 und Typ 968
End connector PV all types as well as end connector Type 960, Type 962 and Type 968

Seilaufbau Structure of strand		1 x 37	1 x 61	1 x 91	1 x 127
Füllfaktor f / Bulk factor f		**0,75**	**0,75**	**0,75**	**0,75**
Verseilfaktor k_s / Strand factor k_s		**0,87**	**0,88**	**0,88**	**0,88**
Verlustfaktor k_e Loss factor k_e	Vergusshülsen mit Metall- u. Kunststoffverguss Sockets with casting in metal and plastic	**1,0**			
	Aufgerollte Gabel-, Ösen- u. Gewindefittinge Swaged fittings	**0,9**			

Endverankerung PV alle Typen sowie Endverankerung PG Typ 980, PG Typ 982 u. PG Typ 988
End connector PV all types as well as end connector PG Type 980, PG Type 982 and PG Type 988

Seilaufbau Structure of strand		1 x 19	1 x 37	1 x 61
Füllfaktor f / Bulk factor f		**0,75**	**0,74**	**0,74**
Verseilfaktor k_s / Strand factor k_s		**0,92**		
Verlustfaktor k_e Loss factor k_e	Vergusshülsen mit Metall- u. Kunststoffverguss Sockets with casting in metal and plastic	**1,0**		
	Aufgerollte Gabel-, Ösen- u. Gewindefittinge Swaged fittings	**0,95**		

Rundlitzenseile
Structural wire ropes

Endverankerung Typ 960, Typ 962 und Typ 968
End connector Type 960, Type 962 and Type 968

Seilaufbau Structure of strand		6x7 SE	6x19 SE	6x19 WS / SE	6x36 WS / SE
Füllfaktor f / Bulk factor f		**0,55**	**0,55**	**0,55**	**0,55**
Verseilfaktor k_s / Strand factor k_s		**0,80**	**0,80**	**0,78**	**0,78**
Verlustfaktor k_e Loss factor k_e	Aufgerollte Gabel-, Ösen- u. Gewindefittinge swaged fittings	**0,9**			

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Tabelle 2.1
Verlustfaktoren k_e,
Verseilfaktoren k_s
für Seile aus unlegiertem Stahl

Table 2.1
Loss factors k_e,
strand factors k_s
for cables of unalloyed steel

Anhang 2.2.1
Annex 2.2.1
zur europäischen technischen Zulassung
to European technical approval

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Tabelle 2.2 – Verlustfaktoren k_e, Füllfaktor f, Verseilfaktoren k_s
Table 2.2 – Loss factor k_e, Bulk factor f, Strand factor k_s

Offene Spiralseile – nichtrostender Stahl
Open spiral strands – stainless steel

Endverankerung Typ 961, Typ 963 und Typ 969
End connector Type 961, Type 963 and Type 969

Seilaufbau Structure of strand		1 x 19	1 x 37	1 x 61	1 x 91
Füllfaktor f Bulk factor f		**0,76**	**0,75**	**0,75**	**0,75**
Verseilfaktor k_s Strand factor k_s		**0,88**	**0,87**	**0,87**	**0,87**
Verlustfaktor k_e Loss factor k_e	Aufgerollte Gabel-, Ösen- u. Gewindefittinge Swaged fittings	**0,9**			

Endverankerung PE Typ 981, PE Typ 983 und PE Typ 989
End connector PE Type 981, PE Type 983 and PE Type 989

Seilaufbau Structure of strand		1 x 19	1 x 37	1 x 61	1 x 91
Füllfaktor f Bulk factor f		**0,75**	**0,75**	**0,74**	**0,74**
Verseilfaktor k_s Strand factor k_s		**0,88**			
Verlustfaktor k_e Loss factor k_e	Aufgerollte Gabel-, Ösen- u. Gewindefittinge Swaged fittings	**0,95**			

Rundlitzenseile – nichtrostender Stahl
Structural wire ropes – stainless steel

Endverankerung Typ 961, Typ 963 und Typ 969
End connector Type 961, Type 963 and Type 969

Seilaufbau Structure of strand		6x7 SE	6x19 SE	6x19 WS / SE	6x36 WS / SE
Füllfaktor f Bulk factor f		**0,55**	**0,55**	**0,55**	**0,55**
Verseilfaktor k_s Strand factor k_s		**0,84**	**0,80**	**0,80**	**0,78**
Verlustfaktor k_e Loss factor k_e	Aufgerollte Gabel-, Ösen- u. Gewindefittinge Swaged fittings	**0,9**			

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Tabelle 2.2
Verlustfaktoren k_e,
Verseilfaktoren k_s
für Seile aus nichtrostendem Stahl

Table 2.2
Loss factors k_e,
strand factors k_s
for cables of unalloyed steel

Anhang 2.2.2
Annex 2.2.2
zur europäischen technischen Zulassung
to European technical approval

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Tabelle 3 – Anhaltswerte für den Verformungsmodul E_Q
Table 3 – Reference values for modulus of elasticity E_Q

	Seiltyp Cable type	**E_Q in [N/mm²]**
Unlegierter Stahl Unalloyed steel	Vollverschlossene Seile Full locked cables	$0{,}16 \times 10^6$
	Offene Spiralseile Open spiral strands	$0{,}16 \times 10^6$
	Rundlitzenseile mit Stahleinlage Structural wire ropes with steel core	$0{,}12 \times 10^6$
Nichtrostender Stahl Stainless steel	Offene Spiralseile Open spiral strands	$0{,}13 \times 10^6$
	Rundlitzenseile mit Stahleinlage Structural wire ropes with steel core	$0{,}10 \times 10^6$

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Tabelle 3
Anhaltswerte für den Verformungsmodul E_Q

Table 3
Reference values for modulus of elasticity E_Q

Anhang 2.3
Annex 2.3
zur europäischen technischen Zulassung
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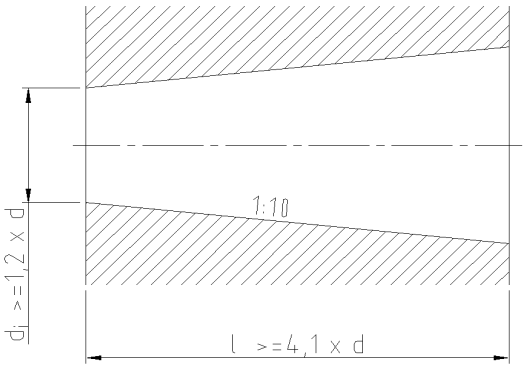
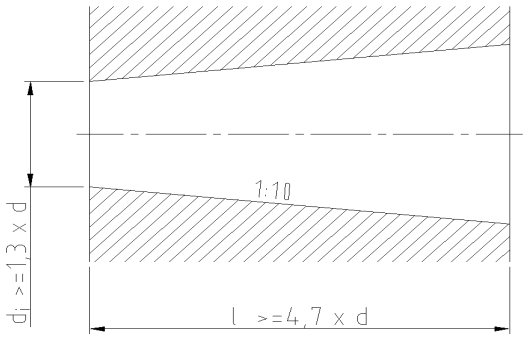
A - Metallverguss vollverschlossener Seile und offener Spiralseile
A - Metal socketing of full locked cables and open spiral strands



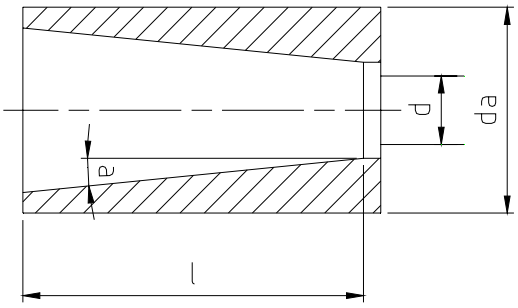
Vergussmaterial:	Zamak ZL 610 EN 1774
Seilkonstruktion:	Vollverschlossene Seile Offene Spiralseile unlegierter Stahl
Seildurchmesser:	20mm ≤ d ≤ 160mm
Socketing material:	Zamak ZL 610 EN 1774
Cable construction:	Full locked cables Open spiral strands unalloyed steel
Cable diameter:	20mm ≤ d ≤ 160mm

B - Kunststoffverguss vollverschlossener Seile und offener Spiralseile
B - Plastic socketing of full locked cables and open spiral strands



Vergussmaterial:	Kunststoffe nach ISO-Report TR 7596
Seilkonstruktion:	Vollverschlossene Seile Offene Spiralseile unlegierter Stahl
Seildurchmesser:	20mm ≤ d ≤ 160mm Seile mit Drahtzahl > 50
Socketing material:	Plastics according to ISO-Report TR 7596
Cable construction:	Full locked cables Open spiral strands unalloyed steel
Cable diameter:	20mm ≤ d ≤ 160mm Cables with number of wires > 50

Anhaltswerte für die Abmessungen zylindrischer Vergusshülsen
Reference values for dimensions of cylindrical sockets



$da = (0,3*f_{y,D}/f_y+1,9)*d$
$5° < a < 9°$

d: Seilnenndurchmesser
$f_{y,D}$: Streckgrenze der Drähte
f_y: Streckgrenze der Verankerungsköpfe
l: 5*d

d: Nominal rope diameter
$f_{y,D}$: Yield strength of the wires
f_y: Yield strength of the socket
l: 5*d

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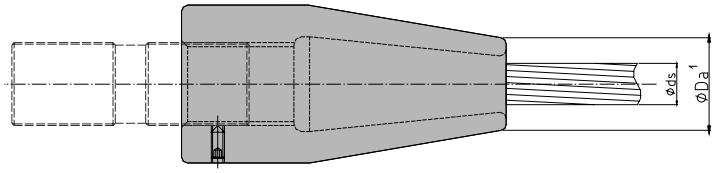
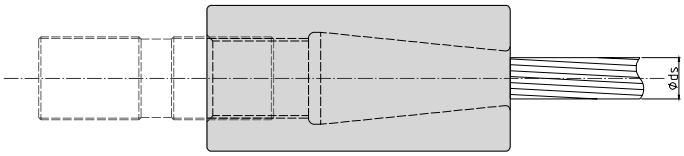
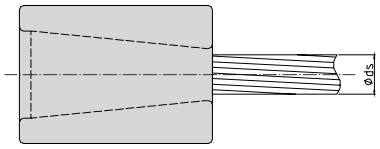
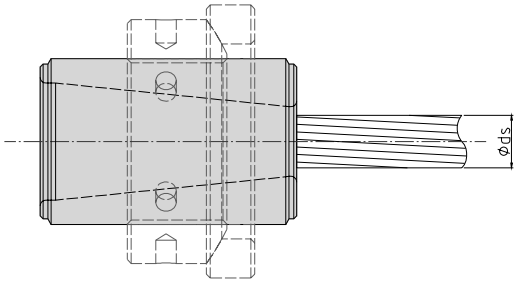
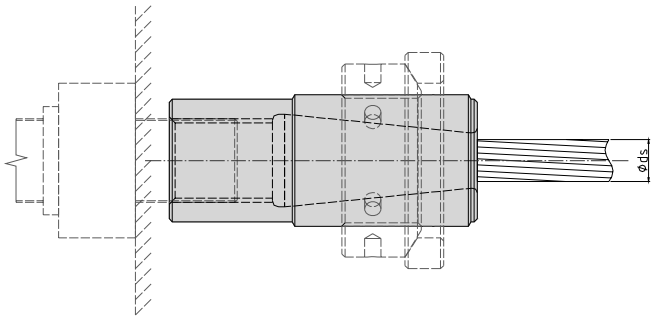
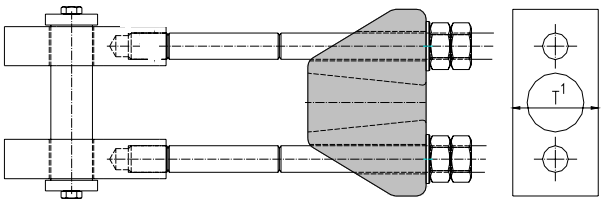
PV Vergussverankerungen, Anhaltswerte für Abmessungen zylindrischer Vergusshülsen

PV Sockets, reference values for dimensions of cylindrical sockets

Anhang 3
Annex 3
zur europäischen technischen Zulassung
to European technical approval

ETA-11/0160

	**Typ 800 / Type 800** **Konische Vergusshülse** **Conical socket** Anschließendes Bauteil: Gewindestange Connecting component: Threaded rod
	**Typ 801 / Type 801** **Zylindrische Vergusshülse** **Cylindrical socket** Anschließendes Bauteil: Gewindestange Connecting component: Threaded rod
	**Typ 811 / Type 811** **Zylindrische Vergusshülse** **Cylindrical socket**
	**Typ 812 / Type 812** **Zylindrische Vergusshülse** **mit Außengewinde** **Cylindrical socket** **with external thread** Anschließendes Bauteil: Sphärische Mutter/Scheibe Typ 813/814 Connecting component: Spherical nut/disc Type 813/814
	**Typ 810 / Type 810** **Zylindrische Vergusshülse** **mit Innen- und Außengewinde** **Cylindrical socket** **with internal and external thread** Anschließende Bauteile: Sphärische Mutter/Scheibe Typ 813/814, Gewindestange Connecting components: Spherical nut/disc Type 813/814, threaded rod
	**Typ 804 / Type 804** **Vergusshülse verstellbar** **Open bridge socket adjustable** Anschließende Bauteile: Augenstäbe, Lagerbolzen Connecting components: Eye bars, pin
[1] Maße beim DIBt hinterlegt / Dimensions deposited at DIBt	

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PV
Vergussverankerungen

PV
Sockets

Anhang 4.1
Annex 4.1
zur europäischen technischen Zulassung
to European technical approval

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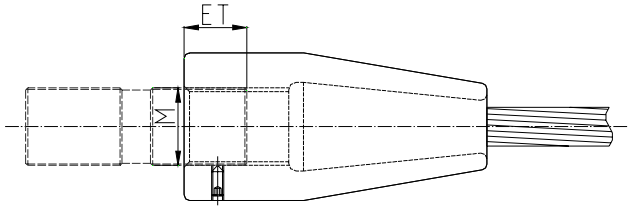
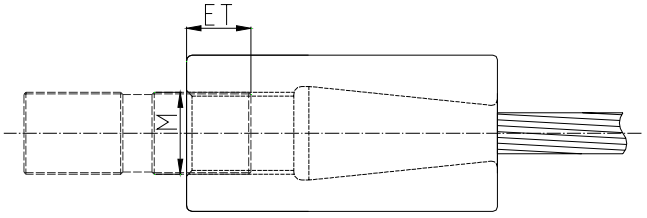
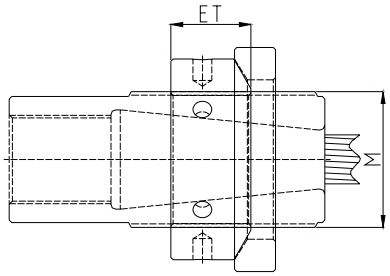
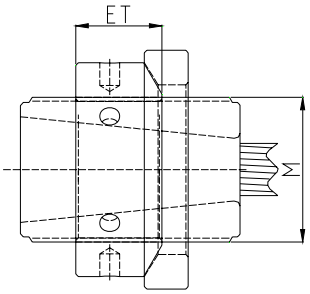
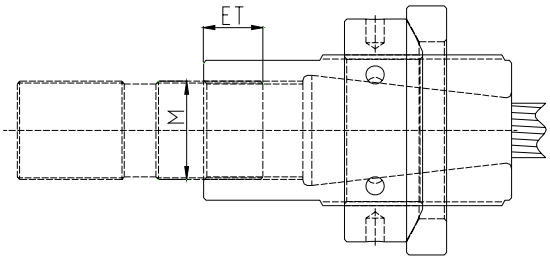
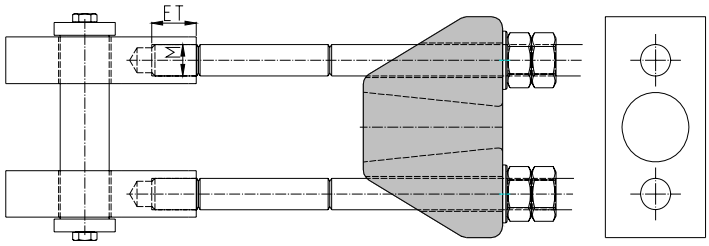
	**Konische Vergusshülse Typ 800** **mit Gewindestange Material S355** **Conical socket Type 800** **with threaded rod material S355** **ETmin = 1.0*M** Sonderfall Typ 864: Siehe Anhang 4.3 Exception Type 864: See Annex 4.3
	**Zylindrische Vergusshülse Typ 801** **mit Gewindestange Material S355** **Cylindrical socket Type 801** **with threaded rod material S355** **ETmin = 1.0*M**
	**Zylindrische Vergusshülse Typ 810** **mit sphärischer Mutter/sphärischer Scheibe Typ 813/814** **Cylindrical socket Type 810** **with spherical nut/spherical disc Type 813/814** **ETmin = 0.6*M**
	**Zylindrische Vergusshülse Typ 812** **mit sphärischer Mutter/sphärischer Scheibe Typ 813/814** **Cylindrical socket Type 812** **with spherical nut/spherical disc Type 813/814** **ETmin = 0.6*M**
	**Nur für Montage** **Only for installation** **Zylindrische Vergusshülse Typ 810** **mit Gewindestange Material S355** **Cylindrical socket Type 810** **with threaded rod material S355** **ETmin = 1.0*M**

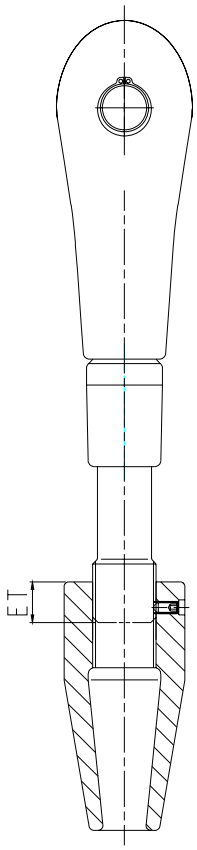
PFEIFER PFEIFER Seil- und Hebetechnik GmbH Dr.-Karl-Lenz-Str.66 87700 Memmingen Tel.: 08331/937 – 0 Fax: 08331/937 – 350 E-Mail: cablestructures@pfeifer.de	**PV** **Einschraubtiefen ET** **PV** **Thread engagements ET**	**Anhang 4.2** **Annex 4.2** zur europäischen technischen Zulassung to European technical approval **ETA-11/0160**



Typ 804 / Type 804

Vergusshülse mit Augenstab verstellbar
Open bridge socket adjustable

ETmin = 1.5*M



Typ 864 / Type 864

Konische Vergusshülse – Gabelkopf
Conical socket - Fork connector

PV 040: ETmin = 27 mm
PV 060: ETmin = 33 mm
PV 090: ETmin = 41 mm
PV 115: ETmin = 47 mm
PV 150: ETmin = 47 mm
PV 195: ETmin = 53 mm
PV 240: ETmin = 59 mm
PV 300: ETmin = 67 mm
PV 360: ETmin = 73 mm

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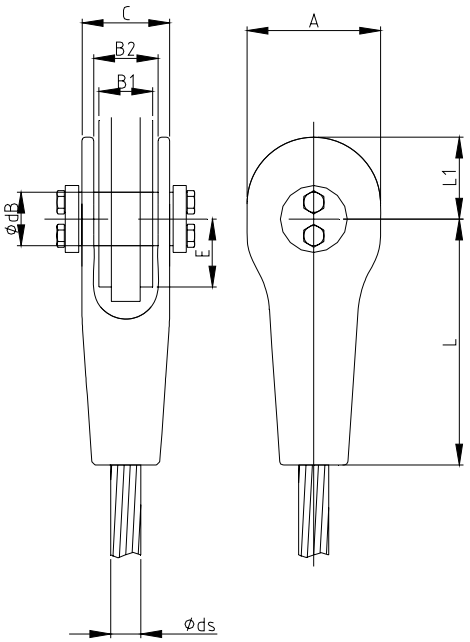
PV
Einschraubtiefen ET

PV
Thread engagements ET

Anhang 4.3
Annex 4.3
zur europäischen technischen Zulassung
to European technical approval

ETA-11/0160



Gabelseilhülse Typ 802 / Open spelter socket Type 802										Bolzen / Pin	
Größe Size	A	B2	C	L1	L	B1	E	Øds		ØdB	
	mm	mm	mm	mm	mm	mm	mm	mm		mm	
PV 40	90	44	60	55	170	40	48	21	G18NiMoCr3-6	39	34CrNiMo6+QT
PV 60	110	55	75	68	210	50	58	26		44	
PV 90	135	66	90	83	255	60	72	31		54	
PV 115	160	77	105	98	295	70	82	35		64	
PV 150	160	77	105	98	295	70	82	40		64	
PV 195	180	88	120	110	340	80	96	45		73	
PV 240	200	99	135	123	380	90	106	50		83	
PV 300	230	110	150	140	425	100	120	55		88	
PV 360	250	121	165	153	465	110	130	60		98	
PV 420	270	132	180	165	510	120	144	65		108	
PV 490	290	143	195	178	550	130	154	70		118	
PV 560	320	154	224	195	595	140	168	75		128	
PV 640	340	165	241	208	635	150	178	80		138	
PV 720	360	176	256	220	680	160	192	85		142	
PV 810	380	187	273	233	720	170	202	90		153	
PV 910	410	198	298	260	780	180	231	95		162	
PV 1010	430	209	305	263	805	190	223	100		172	
PV 1110	450	220	320	275	850	200	240	105		182	
PV 1220	480	227	341	295	900	205	262	110		187	
PV 1340	503	242	364	317	935	218	264	115		202	
PV 1450	530	256	386	335	1015	230	302	120		207	
PV 1580	550	264	396	350	1020	238	288	125		217	
PV 1730	570	275	411	365	1063	247	300	130		227	
PV 1860	590	286	426	380	1105	256	315	135		237	
PV 2000	620	297	441	395	1148	267	324	140		247	

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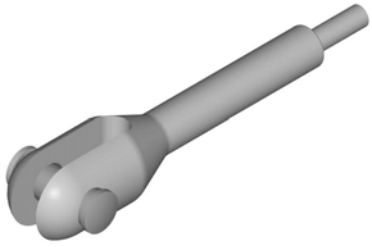
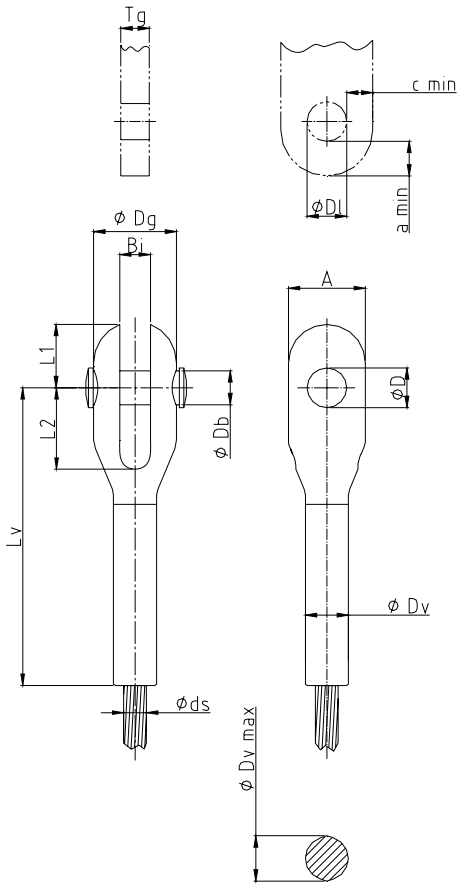
PV Typ 802
Gabelseilhülse
Bolzen

PV Type 802
Open spelter socket
Pin

Anhang 5
Annex 5
zur europäischen technischen Zulassung
to European technical approval

ETA-11/0160





Gabelfitting Typ 960 / Open swaged fitting Type 960												Bolzen / Pin		Anschlusslasche / Connecting plate				
Größe Size	Øds mm	ØD mm	A mm	Bi mm	ØDg mm	ØDv mm	ØDvmax * mm	L1 mm	L2 mm	~Lv max mm		ØDb mm		Tg mm	a mm	c mm	ØDl mm	
30	3	6	12	7	14	6	7	10	14	50	S355J2	5	34CrNiMo6+QT	5	6	4	6	S355J2
40	4	7	15	7	16	8	10	12	16	60		6		5	8	5	7	
50	5	8	18	9	20	11	13	14	19	70		7		6	9	6	8	
60	6	10	22	11	24	11	13	17	23	84		9		8	11	7	10	
80	8	13	27	13	30	15	17	22	30	111		12		10	14	10	13	
100	10	16	33	15	36	19	22	28	36	139		15		12	17	12	16	
120	12	20	40	18	44	22	26	33	44	163		19		15	21	14	20	
140	14	23	48	21	52	26	30	39	51	199		22		18	24	16	23	
160	16	27	56	23	60	30	34	46	59	223		25		20	28	19	27	
180	18	30	61	28	67	34	39	50	67	244		28		25	30	20	30	
200	20	32	67	28	73	38	43	56	73	278		30		25	34	23	32	
220	22	35	72	28	77	40	46	60	77	299		33		25	39	27	35	
240	24	35	77	28	82	44	50	64	80	332		33		25	41	30	35	
260	26	38	84	33	90	48	55	68	88	355		36		30	43	30	38	
280	28	42	89	33	95	52	59	74	93	375		40		30	48	34	42	
300	30	47	98	38	105	56	64	80	103	413		45		35	51	36	47	
320	32	50	106	44	115	58	66	87	113	441		48		40	53	37	50	
340	34	54	112	44	120	62	71	92	118	473		52		40	59	41	54	
360	36	57	118	49	128	66	75	97	126	497		55		45	63	44	57	

*) Nach dem Verpressen / After swaging

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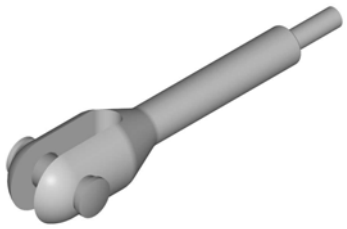
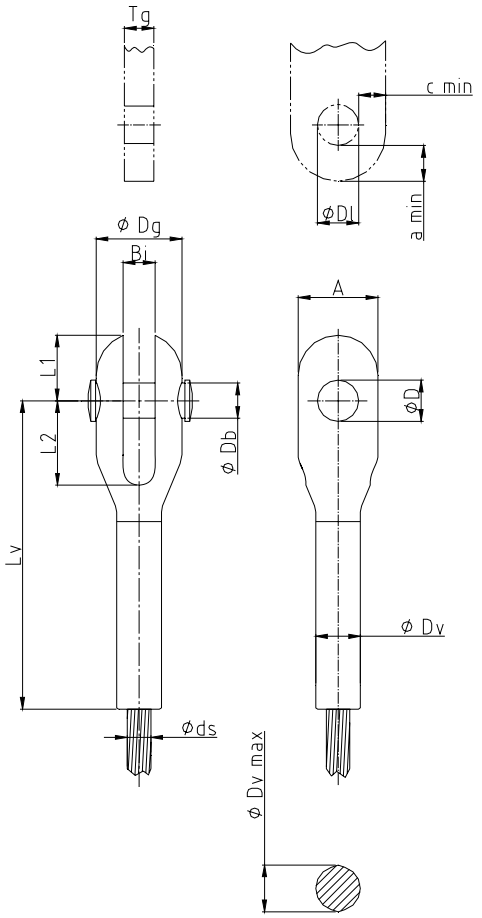
Typ 960
Gabelfitting, Bolzen, Anschlusslasche

Type 960
Open swaged fitting, pin, connecting plate

Anhang 6.1
Annex 6.1
zur europäischen technischen Zulassung
to European technical approval

ETA-11/0160





Gabelfitting Typ 961 / Open swaged fitting Type 961												Bolzen / Pin		Anschlusslasche / Connecting plate				
Größe Size	Øds	ØD	A	Bi	ØDg	ØDv	ØDvmax *	L1	L2	~Lv max		ØDb		Tg	a min	c min	ØDl	
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm		mm		mm	mm	mm	mm	
30	3	6	11	7	13	6	7	10	14	48	1.4462 - S460	5	1.4462 - S690	5	6	4	6	S355
40	4	7	14	7	15	7	9	11	16	58		6		5	7	5	7	
50	5	8	16	8	18	8	10	13	19	68		7		6	8	6	8	
60	6	10	20	10	22	11	13	16	23	79		9		8	10	7	10	
80	8	13	25	12	28	13	15	21	30	108		12		10	13	9	13	
100	10	16	31	14	34	17	20	27	36	134		15		12	16	11	16	
120	12	20	37	17	41	19	22	32	44	159		19		15	20	13	20	
140	14	23	44	20	48	22	26	37	51	193		22	1.4462 - S460	18	23	15	23	
160	16	27	50	22	55	26	30	43	59	215		25		20	27	18	27	
180	18	30	58	28	64	30	34	48	67	239		28		25	29	19	30	
200	20	32	62	28	68	34	39	53	73	271		30		25	32	21	32	
220	22	35	66	28	72	38	43	57	77	287		33		25	36	24	35	
240	24	35	70	28	75	38	43	60	80	321		33		25	38	27	35	
260	26	38	76	33	83	44	50	65	88	342		36		30	40	27	38	
280	28	42	83	33	89	44	50	70	93	367		40		30	45	31	42	
300	30	47	90	38	98	48	55	77	103	403		45		35	48	32	47	
320	32	50	97	43	106	52	59	82	113	426		48		40	50	33	50	
340	34	54	103	43	112	56	64	88	118	458		52		40	55	37	54	
360	36	57	109	48	119	58	66	92	126	482		55		45	57	38	57	

*) Nach dem Verpressen / After swaging

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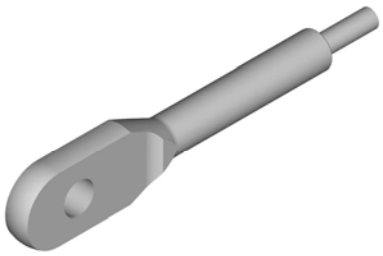
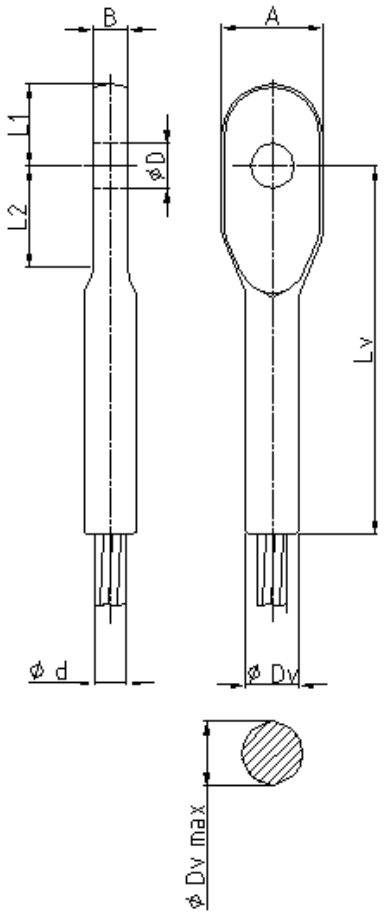
Typ 961
Gabelfitting, Bolzen,
Anschlusslasche

Type 961
Open swaged fitting, pin,
connecting plate

Anhang 6.2
Annex 6.2
zur europäischen technischen Zulassung
to European technical approval

ETA-11/0160





Ösenfitting Typ 962 / Closed swaged fitting Type 962										
Größe Size	∅d mm	A mm	B mm	∅D mm	∅Dv mm	∅Dvmax * mm	L1 mm	L2 mm	~Lv max mm	
30	3	14	5	6	6	7	11	14	50	
40	4	16	5	7	8	10	13	16	60	
50	5	20	6	8	11	13	15	20	70	
60	6	24	8	10	11	13	18	23	84	
80	8	30	10	13	15	17	24	29	111	
100	10	36	12	16	19	22	29	36	139	
120	12	44	15	20	22	26	35	44	163	S355J2
140	14	52	18	23	26	30	41	51	199	
160	16	60	20	27	30	34	48	59	223	
180	18	67	25	30	34	39	53	67	244	
200	20	73	25	32	38	43	59	72	278	
220	22	77	25	35	40	46	63	76	299	
240	24	82	25	35	44	50	66	80	332	
260	26	90	30	38	48	55	72	88	355	
280	28	95	30	42	52	59	77	93	375	
300	30	105	35	47	56	64	84	103	413	
320	32	115	40	50	58	66	91	113	441	
340	34	120	40	54	62	71	96	118	473	
360	36	128	45	57	66	75	102	126	497	

*) Nach dem Verpressen / After swaging

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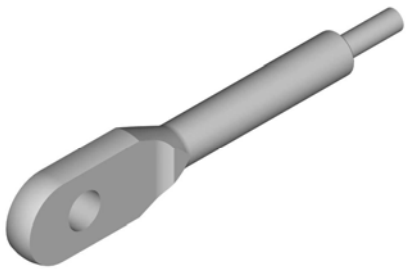
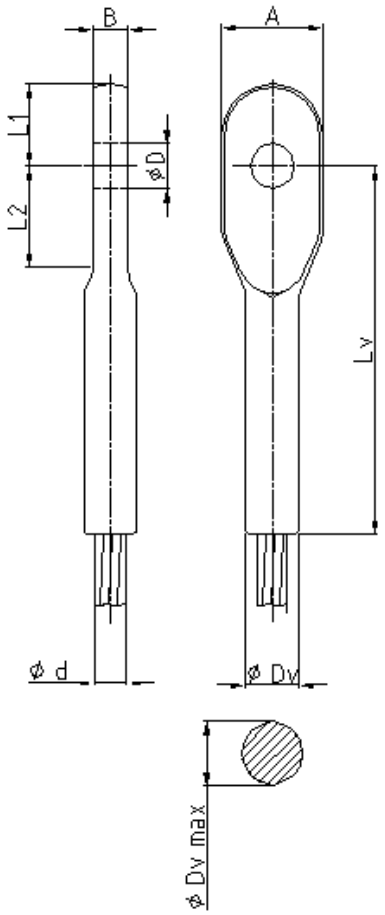
Typ 962
Ösenfitting

Type 962
Closed swaged fitting

Anhang 7.1
Annex 7.1
zur europäischen technischen Zulassung
to European technical approval

ETA-11/0160





Ösenfitting Typ 963 / Closed swaged fitting Type 963										
Größe Size	Ød mm	A mm	B mm	ØD mm	ØDv mm	ØDvmax * mm	L1 mm	L2 mm	~Lv max mm	
30	3	13	5	6	6	7	11	14	48	
40	4	15	5	7	7	9	12	15	58	
50	5	18	6	8	8	10	14	18	69	
60	6	22	8	10	11	13	17	22	79	
80	8	28	10	13	13	15	23	29	108	
100	10	34	12	16	17	20	28	35	134	
120	12	41	15	20	19	22	34	42	159	
140	14	48	18	23	22	26	39	49	193	
160	16	55	20	27	26	30	46	57	215	
180	18	64	25	30	30	34	52	66	239	
200	20	68	25	32	34	39	56	70	269	
220	22	72	25	35	38	43	60	74	287	
240	24	75	25	35	38	43	63	77	321	
260	26	83	30	38	44	50	68	85	342	
280	28	89	30	42	44	50	74	90	367	
300	30	98	35	47	48	55	81	100	403	
320	32	106	40	50	52	59	87	108	426	
340	34	112	40	54	56	64	92	114	458	
360	36	119	45	57	58	66	97	121	482	

1.4462 - S460

*) Nach dem Verpressen / After swaging

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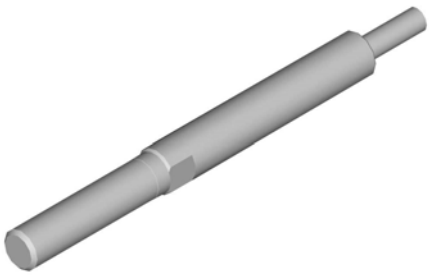
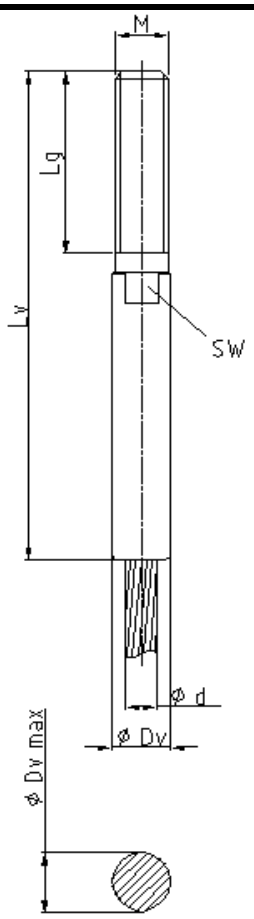
Typ 963
Ösenfitting

Type 963
Closed swaged fitting

Anhang 7.2
Annex 7.2
zur europäischen technischen Zulassung
to European technical approval

ETA-11/0160





Gewindefitting Typ 968 / Swaged fitting with thread Type 968									
Größe Size	Ød mm	M mm	Lg mm	~Lv max mm	ØDv mm	ØDvmax * mm	SW mm	min. Einschraubtiefe min. thread engagement mm	S355J2
30	3	5	23	62	6	7	5	5	
40	4	8	28	75	8	10	7	8	
50	5	8	30	86	11	13	9	8	
60	6	10	37	101	11	13	9	10	
80	8	14	49	137	15	17	13	14	
100	10	16	64	176	19	22	17	16	
120	12	20	74	203	22	26	19	20	
140	14	24	93	253	26	30	22	24	
160	16	27	102	279	30	34	24	27	
180	18	30	110	304	34	39	30	30	
200	20	33	130	354	38	43	32	33	
220	22	36	140	382	40	46	32	36	
240	24	39	160	432	44	50	36	39	
260	26	42	167	457	48	55	43	42	
280	28	45	176	483	52	59	46	45	
300	30	48	194	531	56	64	46	48	
320	32	52	207	562	58	66	50	52	
340	34	56	226	610	62	71	50	56	
360	36	60	236	638	66	75	55	60	

*) Nach dem Verpressen / After swaging

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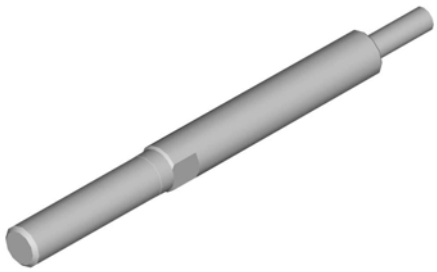
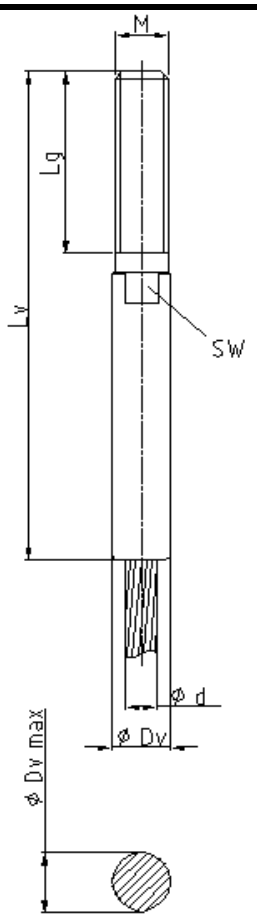
Typ 968
Gewindefitting

Type 968
Swaged fitting with thread

Anhang 8.1
Annex 8.1
zur europäischen technischen Zulassung
to European technical approval

ETA-11/0160





Gewindefitting Typ 969 / Swaged fitting with thread Type 969									
Größe Size	Ød mm	M mm	Lg mm	~Lv max mm	ØDv mm	ØDvmax * mm	SW mm	min. Einschraubtiefe min. thread engagement mm	1.4462 - S460
30	3	5	22	60	6	7	5	5	
40	4	6	27	73	7	9	6	6	
50	5	8	33	85	8	10	6	8	
60	6	10	36	98	11	13	9	10	
80	8	12	51	134	13	15	11	12	
100	10	14	63	164	17	20	13	14	
120	12	16	73	196	19	22	17	16	
140	14	20	93	240	22	26	19	20	
160	16	22	101	262	26	30	22	22	
180	18	24	108	284	30	34	22	24	
200	20	27	126	333	34	39	27	27	
220	22	30	136	355	38	43	30	30	
240	24	33	158	409	38	43	32	33	
260	26	36	166	431	44	50	32	36	
280	28	39	179	458	44	50	36	39	
300	30	42	197	507	48	55	43	42	
320	32	45	205	529	52	59	46	45	
340	34	48	224	573	56	64	46	48	
360	36	48	231	595	58	66	46	48	

*) Nach dem Verpressen / After swaging

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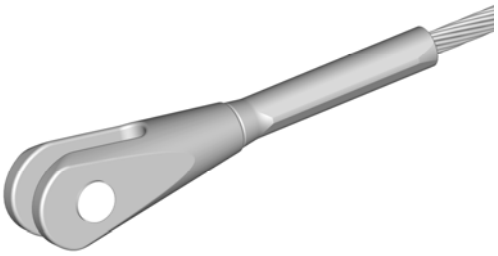
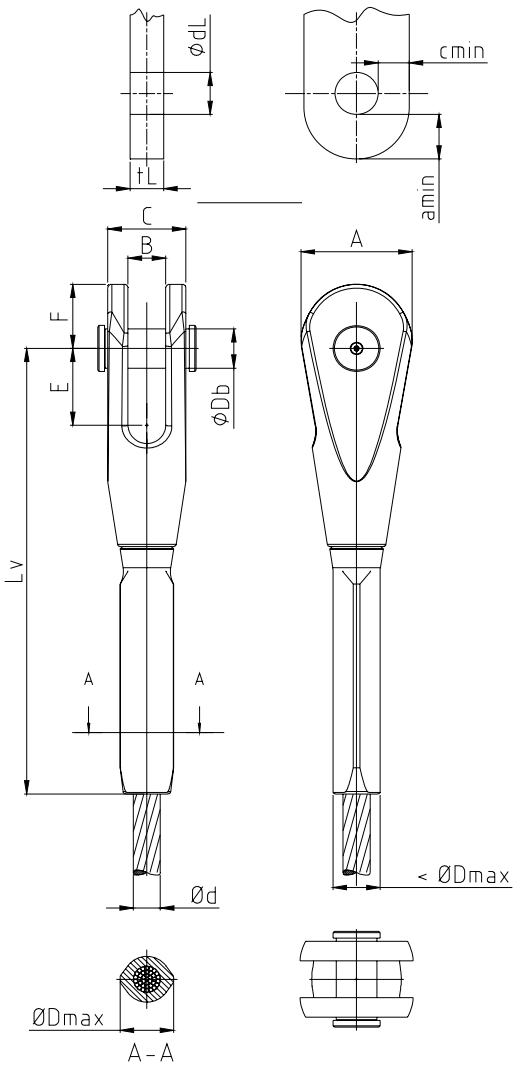
Typ 969
Gewindefitting

Type 969
Swaged fitting with thread

Anhang 8.2
Annex 8.2
zur europäischen technischen Zulassung
to European technical approval

ETA-11/0160





Gabelkopf Fork connector							Fitting Fitting		Gabelfitting Typ 980 Open swaged fitting		Bolzen Pin		Anschlusslasche Connecting plate				
Größe Size	A	B	C	E	F		ØDmax *		~Lv *	Ød	ØDb		ØdL	tL	amin	cmin	
	mm	mm	mm	mm	mm		mm		mm	mm	mm		mm	mm	mm	mm	
PG 5	33	12,5	25	24	20	EN-GJS-400-18-LT	16	S460N	137	8,1	12	34CrNiMo6V	13	10	14	10	S355J2
PG 10	43	14,5	30	29	25		20		170	10,1	15		16	12	17	12	
PG 15	51	17,5	37	35	30		25		205	12,2	19		20	15	22	15	
PG 20	61	20,5	42	41	35		30		240	14,1	22		23	18	25	17	
PG 25	69	22,5	48	48	41		34		283	17,0	25		27	20	29	20	
PG 40	84	28	59	58	49		40		343	20,1	30		32	25	34	24	
PG 55	103	28	70	66	60		50		411	24,4	33		35	25	41	30	
PG 75	119	33	82	76	69		57		480	28,3	40		42	30	48	34	
PG 90	128	38	87	84	74		64		521	31,3	45		47	35	51	36	
PG 125	152	49	105	101	89		71		616	36,3	55		57	45	63	44	

*) Nach dem Verpressen / After swaging

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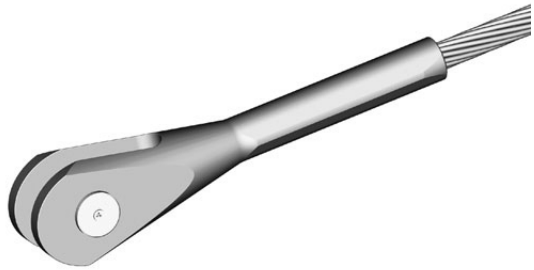
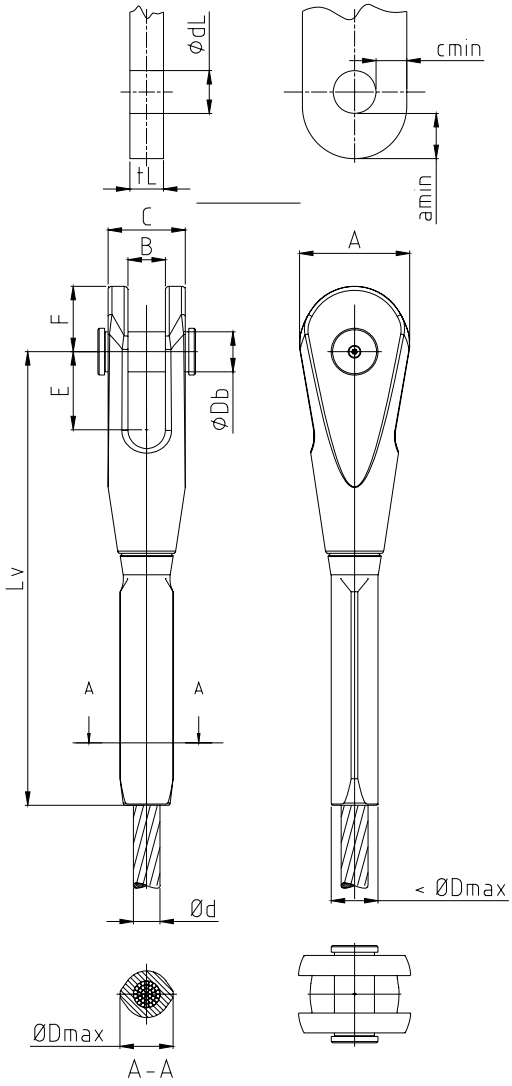
PG Typ 980
Gabelfitting, Bolzen,
Anschlusslasche

PG Type 980
Open swaged fitting, pin,
connecting plate

Anhang 9.1
Annex 9.1
zur europäischen Zulassung
to European technical approval

ETA-11/0160





Gabelfitting Typ 981 Open swaged fitting Type 981											Bolzen Pin		Anschlusslasche Connecting plate				
Größe Size	A	B	C	E	F	G	ØDmax *	~Lv *	Ød		ØDb		ØdL	tL	amin	cmin	
	mm	mm	mm	mm	mm	mm	mm	mm	mm		mm		mm	mm	mm	mm	
PE 3	25	10,5	18	18	15	27	13	101	6,1	1.4462 - S460	9	1.4462 - S460	10	8	11	9	S355
PE 5	32	12,5	23	24	20	32	15	129	8,1		12		13	10	14	10	
PE 7	40	14,5	27	29	24	36	20	156	10,1		15		16	12	17	12	
PE 10	50	17,5	33	35	30	39	22	190	11,9		19		20	15	22	15	
PE 15	57	20,5	38	41	35	50	26	223	14,1		22		23	18	25	17	
PE 20	67	22,5	43	48	41	55	30	258	16,6		25		27	20	29	20	
PE 30	80	28	52	59	48	64	39	310	20,5		30		32	25	34	24	
PE 45	96	28	58	66	57	73	44	383	24,1		33		35	25	41	30	
PE 60	110	33	68	77	67	83	51	424	28,6		40		42	30	48	34	
PE 75	117	38	76	84	71	95	60	466	32,1		45		47	35	51	36	
PE 100	142	49	92	102	86	111	66	547	36,6		55		57	45	63	44	

*) Nach dem Verpressen / After swaging

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PE Typ 981
Gabelfitting, Bolzen,
Anschlusslasche

PE Type 981
Open swaged fitting, pin,
connecting plate

Anhang 9.2
Annex 9.2
zur europäischen technischen Zulassung
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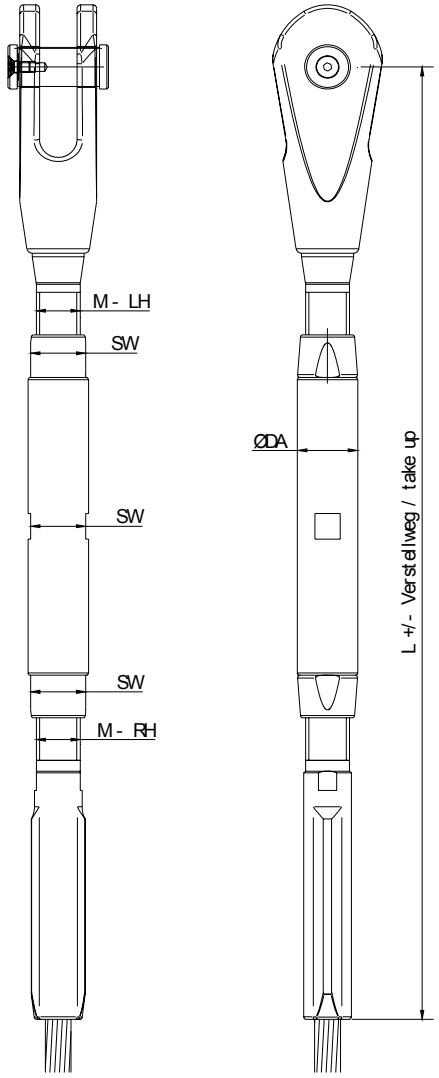
ETA-11/0160



	Gabelkopf Fork connector	Gewindefitting Fitting with thread	min. Einschraubtiefe min. thread engagement	Spannschloss Turnbuckle					
Größe Size				L **mm**	Verstellweg Take up **mm**	∅DA **mm**	SW **mm**	M **mm**	
PG 5	PG Typ 980 PG Type 980	PG Typ 988 PG Type 988	Siehe Typ 988 See Type 988	310	±28	18,5	16	14	**S460N**
PG 10				369	±32	22,0	20	16	
PG 15				455	±40	27,0	24	20	
PG 20				537	±48	33,0	30	24	
PG 25				619	±54	37,0	34	27	
PG 40				723	±60	42,5	38	30	
PG 55				875	±72	51,0	46	36	
PG 75				1017	±84	59,5	55	42	
PG 90				1133	±96	67,0	60	48	
PG 125				1313	±112	78,0	70	56	

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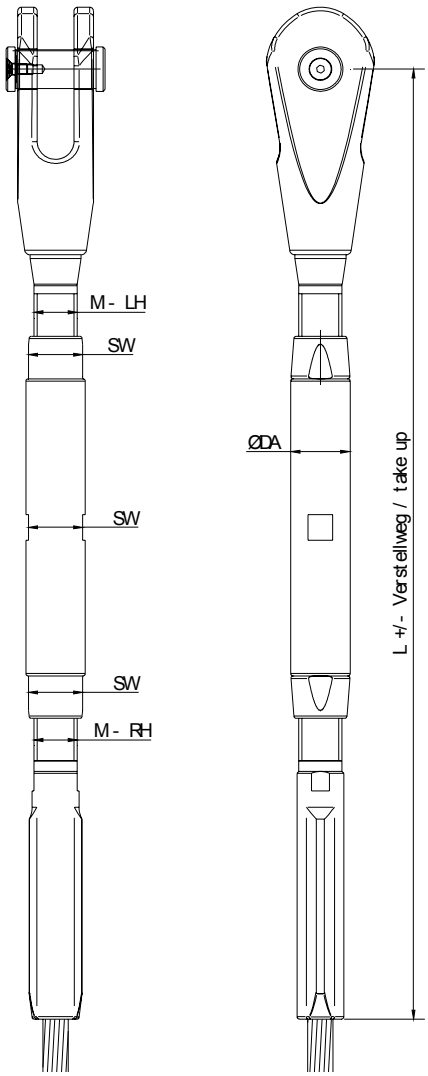
PG Typ 984
Gabelspannschloss

PG Type 984
Turnbuckle with open socket

Anhang 9.3
Annex 9.3
zur europäischen technischen Zulassung
to European technical approval

ETA-11/0160



	Gabelkopf Fork connector	Gewindefitting Fitting with thread	min. Einschraubtiefe min. thread engagement	Spannschloss Turnbuckle					
Größe Size				L **mm**	Verstellweg Take up **mm**	ØDA **mm**	SW **mm**	M **mm**	
PE 3	PE Typ 985 PE Type 985	PE Typ 989 PE Type 989	Siehe Typ 989 See Type 989	225	±20	14	12	10	**1.4462 - S460**
PE 5				294	±28	18	16	14	
PE 7				353	±32	22	20	16	
PE 10				427	±40	27	24	20	
PE 15				503	±48	32	29	24	
PE 20				575	±54	37	34	27	
PE 30				680	±60	42	38	30	
PE 45				816	±72	49	44	36	
PE 60				927	±84	59	54	42	
PE 75				1047	±96	64	58	48	
PE 100				1215	±112	74	68	56	

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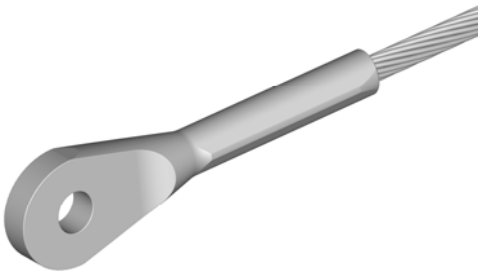
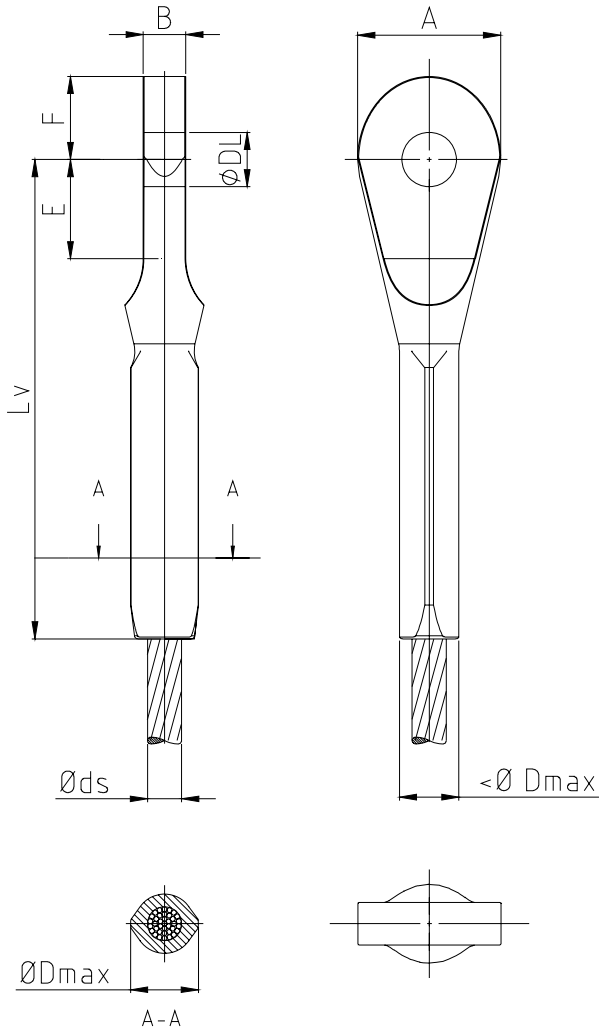
PE Typ 985
Gabelspannschloss

PE Type 985
Turnbuckle with open socket

Anhang 9.4
Annex 9.4
zur europäischen technischen Zulassung
to European technical approval

ETA-11/0160





Ösenfitting Typ 982 / Closed swaged fitting									
Größe Size	A **mm**	B **mm**	∅Dmax * **mm**	∅DL **mm**	E **mm**	F **mm**	~Lv * **mm**	Øds **mm**	**S460N**
PG 5	32	10	16	13	24	20	120	8,1	
PG 10	40	12	20	16	29	25	145	10,1	
PG 15	50	15	25	20	35	30	175	12,2	
PG 20	57	18	30	23	41	35	204	14,1	
PG 25	67	20	34	27	48	41	245	17,0	
PG 40	80	25	40	32	58	49	286	20,1	
PG 55	96	25	50	35	66	60	338	24,4	
PG 75	110	30	57	42	76	69	392	28,3	
PG 90	117	35	64	47	84	74	437	31,3	
PG 125	142	45	71	57	101	89	515	36,3	

*) Nach dem Verpressen / After swaging

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PG Typ 982
Ösenfitting

PG Type 982
Closed swaged fitting

Anhang 10.1
Annex 10.1
zur europäischen technischen Zulassung
to European technical approval

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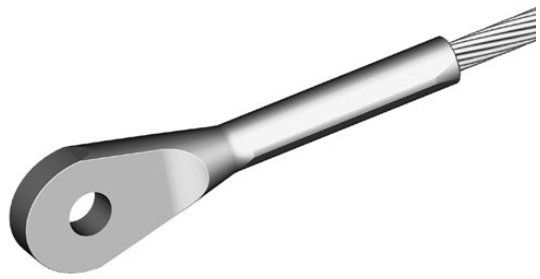

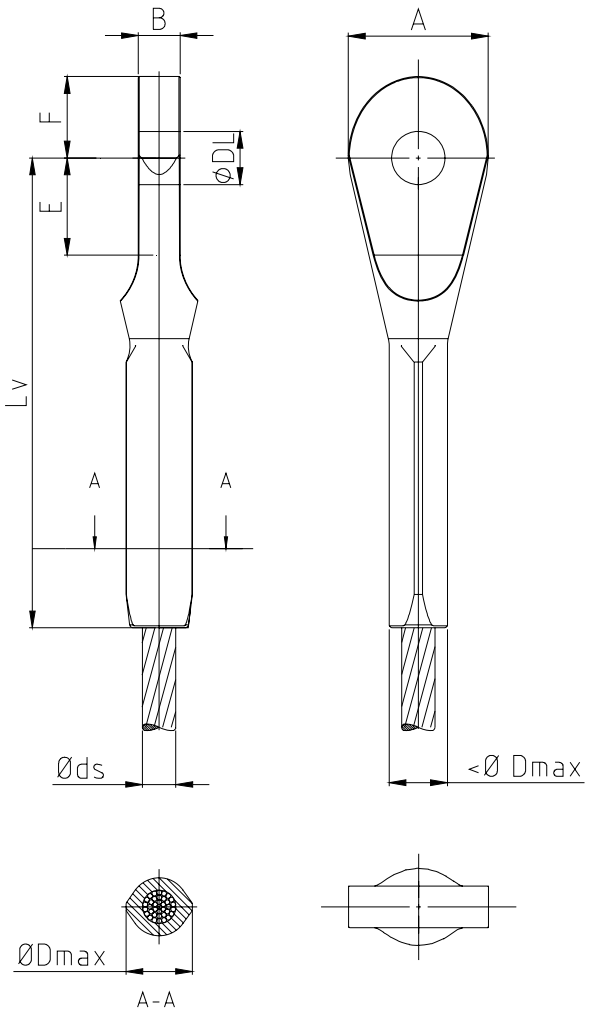

Ösenfitting Typ 983 / Closed swaged fitting Type 983									
Größe Size	A	B	ØDmax *	ØDL	E	F	~Lv *	Øds	
	mm	mm	mm	mm	mm	mm	mm	mm	
PE 3	25	8	13	10	18	15	86	6,1	1.4462 - S460
PE 5	32	10	15	13	24	20	115	8,1	
PE 7	40	12	20	16	29	24	145	10,1	
PE 10	50	15	22	20	35	30	176	11,9	
PE 15	57	18	26	23	41	35	206	14,1	
PE 20	67	20	30	27	48	41	235	16,6	
PE 30	80	25	39	32	59	48	290	20,5	
PE 45	96	25	44	35	66	57	344	24,1	
PE 60	110	30	51	42	77	67	400	28,6	
PE 75	117	35	60	47	84	71	447	32,1	
PE 100	142	45	66	57	102	86	504	36,6	

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PE Typ 983
Ösenfitting

PE Type 983
Closed swaged fitting

Anhang 10.2
Annex 10.2
zur europäischen technischen Zulassung
to European technical approval

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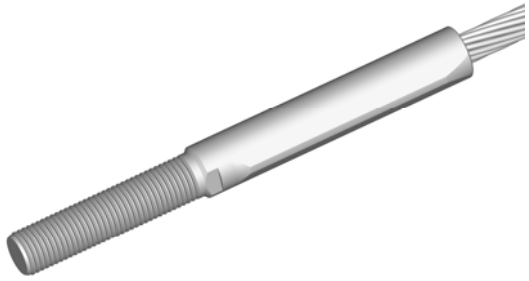

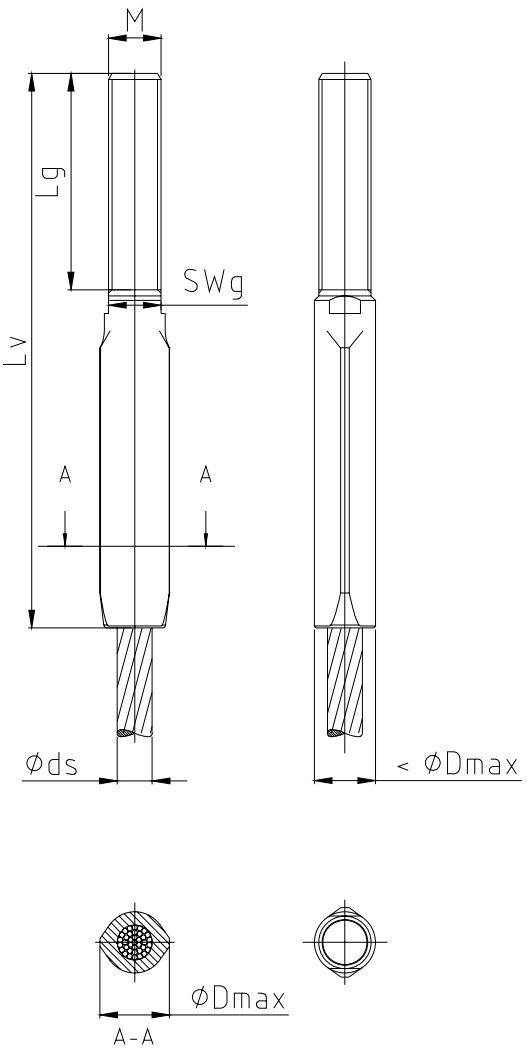

Gewindefitting Typ 988 / Swaged fitting with thread Type 988								
Größe Size	M	∅Dmax *	Lg	~Lv *	SWg	∅ds	min. Einschraubtiefe min. thread engagement	
	mm	**mm**	**mm**	**mm**	**mm**	**mm**	**mm**	
PG 5	14	16	56	141	13	8,1	13	**S460N**
PG 10	16	20	64	168	16	10,1	14	
PG 15	20	25	80	206	19	12,2	18	
PG 20	24	30	96	244	24	14,1	22	
PG 25	27	34	108	285	27	17,0	24	
PG 40	30	40	120	328	30	20,1	27	
PG 55	36	50	144	394	36	24,4	32	
PG 75	42	57	168	459	41	28,3	38	
PG 90	48	64	192	515	46	31,3	43	
PG 125	56	71	224	597	55	36,3	50	

*) Nach dem Verpressen / After swaging

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PG Typ 988
Gewindefitting

PG Type 988
Swaged fitting with thread

Anhang 11.1
Annex 11.1
zur europäischen technischen Zulassung
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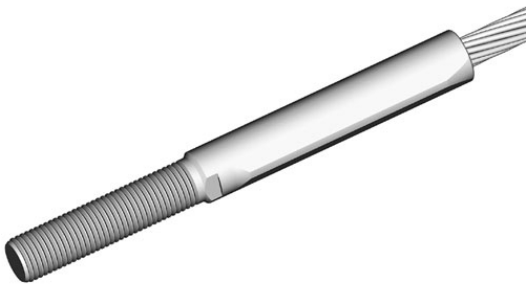

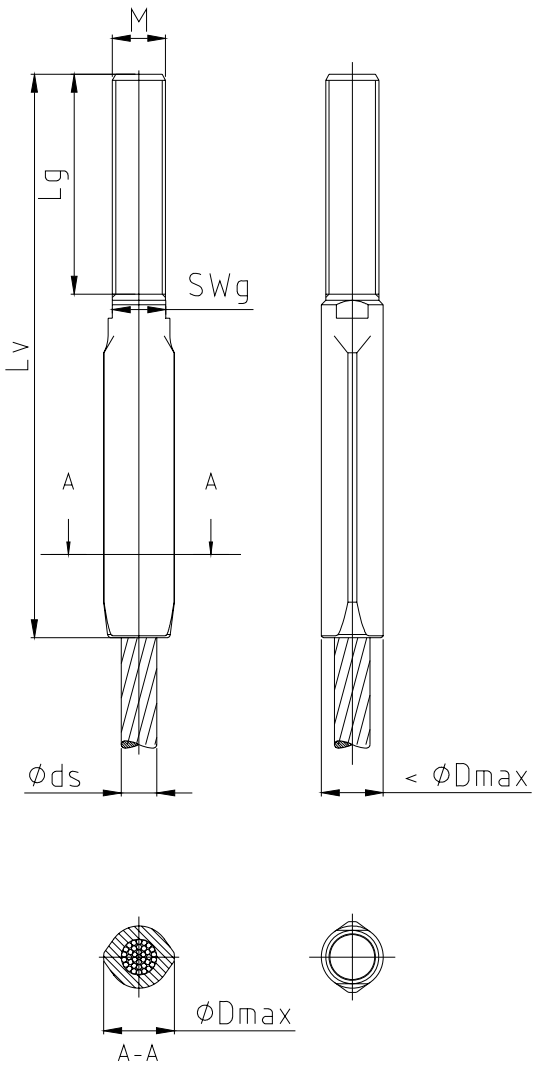

Gewindefitting Typ 989 / Swaged fitting with thread Type 989								
Größe Size	M **mm**	∅Dmax * **mm**	Lg **mm**	~Lv * **mm**	SWg **mm**	Øds **mm**	min. Einschraubtiefe min. thread engagement **mm**	**1.4462 - S460**
PE 3	10	13	40	104	9	6,1	9	
PE 5	14	15	56	140	12	8,1	13	
PE 7	16	20	64	169	15	10,1	14	
PE 10	20	22	80	205	17	11,9	18	
PE 15	24	26	96	243	20	14,1	22	
PE 20	27	30	108	274	24	16,6	24	
PE 30	30	39	120	329	30	20,5	27	
PE 45	36	44	144	393	32	24,1	32	
PE 60	42	51	168	456	36	28,6	38	
PE 75	48	60	192	523	45	32,1	43	
PE 100	56	66	224	594	50	36,6	50	

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PE Typ 989
Gewindefitting

PE Type 989
Swaged fitting with thread

Anhang 11.2
Annex 11.2
zur europäischen technischen Zulassung
to European technical approval

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Größe Size	Seil-Nenndurchmesser Nominal strand diameter **[mm]**	Charakteristische Zugtragfähigkeit $Z_{R,k}$ für min. $f_{u,k}$ = 1570 N/mm² Characteristic tension resistance $Z_{R,k}$ for min. $f_{u,k}$ = 1570 N/mm² **[kN]**	Grenzzugkraft $Z_{R,d}$ Design tension resistance $Z_{R,d}$ **[kN]**
PV 40	21	405	245
PV 60	26	621	376
PV 90	31	916	555
PV 115*	35	1170	709
PV 150	40	1520	921
PV 195	45	1930	1170
PV 240	50	2380	1442
PV 300	55	3020	1830
PV 360	60	3590	2176
PV 420	65	4220	2558
PV 490	70	4890	2964
PV 560	75	5620	3406
PV 640	80	6390	3873
PV 720	85	7210	4370
PV 810	90	8090	4903
PV 910	95	9110	5521
PV 1010	100	10100	6121
PV 1110	105	11100	6727
PV 1220	110	12200	7394
PV 1340	115	13400	8121
PV 1450	120	14500	8788
PV 1580	125	15800	9576
PV 1730	130	17300	10485
PV 1860	135	18600	11273
PV 2000	140	20000	12121
PV 2150	145	21500	13030
PV 2300	150	23000	13939
PV 2450	155	24500	14848
PV 2600	160	26000	15758

* die Hülsen der Seilgrößen PV 115 und PV 150 sind identisch / sockets of wire rope sizes PV 115 and PV 150 are identical

Alle dazugehörenden PV-Seilendbeschläge sind für Zugfestigkeiten der Seile von min. $f_{u,k}$ = 1570 N/mm² auf die in der Tabelle angegebenen charakteristischen Zugtragfähigkeiten $Z_{R,k}$ bzw. auf die in der Tabelle angegebenen Grenzzugkräfte $Z_{R,d}$ ausgelegt.

Beispiel:
Seil PV 40 mit den Endbeschlägen und Verbindungsteilen Typ 800-PV 40, Typ 801-PV 40, Typ 802-PV 40, Typ 804-PV 40, Typ 810 (inkl. Typ 813/814)-PV 40, Typ 811-PV 40, Typ 812 (inkl. Typ 813/814)-PV 40, Typ 840-PV 40 oder Typ 864-PV 40 ist für eine charakteristische Zugtragfähigkeit von 405 kN bzw. für eine Grenzzugkraft von 245 kN ausgelegt.

All corresponding PV-cable end connectors for tension resistances of the wire ropes of min. $f_{u,k}$ = 1570 N/mm² are designed for the characteristic tension resistances $Z_{R,k}$ respectively for the design tension resistances $Z_{R,d}$ shown in the table.

Example:
Cable PV 40 with end terminals and connectors Type 800-PV 40, Type 801-PV 40, Type 802-PV 40, Type 804-PV 40, Type 810 (incl. Type 813/814)-PV 40, Type 811-PV 40, Type 812(incl. Type 813/814)-PV 40, Type 840-PV 40 or Type 864-PV 40 is designed for the characteristic tension resistance 405 kN respectively for the design tension resistance 245 kN.

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PV
Charakteristische Zugtragfähigkeiten $Z_{R,k}$ und Grenzzugkräfte $Z_{R,d}$

PV
Characteristic tension resistances $Z_{R,k}$ and design tension resistances $Z_{R,d}$

Anhang 12.1
Annex 12.1
zur europäischen technischen Zulassung
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Größe Size	Seil-Nenndurchmesser Nominal strand diameter **[mm]**	Charakteristische Zugtragfähigkeit $Z_{R,k}$ für min. $f_{u,k}$ = 1770 N/mm² Characteristic tension resistance $Z_{R,k}$ for min. $f_{u,k}$ = 1770 N/mm² **[kN]**	Grenzzugkraft $Z_{R,d}$ Design tension resistance $Z_{R,d}$ **[kN]**
PG 5	8,1	59	36
PG 10	10,1	93	56
PG 15	12,2	134	81
PG 20	14,1	181	109
PG 25	17,0	260	158
PG 40	20,1	367	222
PG 55	24,4	537	326
PG 75	28,3	722	438
PG 90	31,3	884	536
PG 125	36,3	1189	721

Alle dazugehörenden PG-Seilendbeschläge sind für Zugfestigkeiten der Seile von min. $f_{u,k}$ = 1770 N/mm² auf die in der Tabelle angegebenen charakteristischen Zugtragfähigkeiten $Z_{R,k}$ bzw. auf die in der Tabelle angegebenen Grenzzugkräfte $Z_{R,d}$ ausgelegt.

Beispiel:
Seil PG 5 mit den Endbeschlägen Typ 980-PG 5, Typ 982-PG 5, Typ 984-PG 5 oder Typ 988-PG 5 ist für eine charakteristische Zugtragfähigkeit von 59 kN bzw. für eine Grenzzugkraft von 36 kN ausgelegt.

All corresponding PG-cable end connectors for tension resistances of the wire ropes of min. $f_{u,k}$ = 1770 N/mm² are designed for the characteristic tension resistances $Z_{R,k}$ respectively for the design tension resistances $Z_{R,d}$ shown in the table.

Example:
Cable PG 5 with end terminals Type 980-PG 5, Type 982-PG 5, Type 984-PG 5 or Type 988-PG 5 is designed for the characteristic tension resistance 59 kN respectively for the design tension resistance 36 kN.

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PG
Charakteristische Zugtragfähigkeiten $Z_{R,k}$ und Grenzzugkräfte $Z_{R,d}$

PG
Characteristic tension resistances $Z_{R,k}$ and design tension resistances $Z_{R,d}$

Anhang 12.2
Annex 12.2
zur europäischen technischen Zulassung
to European technical approval

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Größe Size	Seil-Nenndurchmesser Nominal strand diameter **[mm]**	Charakteristische Zugtragfähigkeit $Z_{R,k}$ für min. $f_{u,k}$ = 1450 N/mm² Characteristic tension resistance $Z_{R,k}$ für min. $f_{u,k}$ = 1450 N/mm² **[kN]**	Grenzzugkraft $Z_{R,d}$ Design tension resistance $Z_{R,d}$ **[kN]**
PE 3	6,1	26	16
PE 5	8,1	47	28
PE 7	10,1	73	44
PE 10	11,9	101	61
PE 15	14,1	141	86
PE 20	16,6	195	118
PE 30	20,5	298	180
PE 45	24,1	409	248
PE 60	28,6	578	350
PE 75	32,1	730	442
PE 100	36,6	945	573

Alle dazugehörenden PE-Seilendbeschläge sind für Zugfestigkeiten der Seile von min. $f_{u,k}$ = 1450 N/mm² auf die in der Tabelle angegebenen charakteristischen Zugtragfähigkeiten $Z_{R,k}$ bzw. auf die in der Tabelle angegebenen Grenzzugkräfte $Z_{R,d}$ ausgelegt.

Beispiel:
Seil PE 3 mit den Endbeschlägen Typ 981-PE 3, Typ 983-PE 3, Typ 985-PE 3 oder Typ 989-PE 3 ist für eine charakteristische Zugtragfähigkeit von 26 kN bzw. für eine Grenzzugkraft von 16 kN ausgelegt.

All corresponding PE-cable end connectors for tension resistances of the wire ropes of min. $f_{u,k}$ = 1450 N/mm² are designed for the characteristic tension resistances $Z_{R,k}$ respectively for the design tension resistances $Z_{R,d}$ shown in the table.

Example:
Cable PE 3 with end terminals Type 981-PE 3, Type 983-PE 3, Type 985-PE 3 or Type 989-PE 3 is designed for the characteristic tension resistance 26 kN respectively for the design tension resistance 16 kN.

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PE
Charakteristische Zugtragfähigkeiten $Z_{R,k}$ und Grenzzugkräfte $Z_{R,d}$

PE
Characteristic tension resistances $Z_{R,k}$ and design tension resistances $Z_{R,d}$

Anhang 12.3
Annex 12.3
zur europäischen technischen Zulassung
to European technical approval

ETA-11/0160