

## European Technical Approval ETA-13/0649

English translation prepared by DIBt - Original version in German language

Handelsbezeichnung  
*Trade name*

PAM-DUKTILPFAHL  
*PAM-ductilepile*

Zulassungsinhaber  
*Holder of approval*

Saint-Gobain PAM Deutschland GmbH  
Saarbrücker Straße 51  
66130 Saarbrücken  
DEUTSCHLAND

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

Pfahlrohre aus duktilem Gusseisen  
*Pile pipes made of ductile iron*

Geltungsdauer:  
*Validity:* vom  
*from*  
bis  
*to*

18 June 2013  
18 June 2018

Herstellwerk  
*Manufacturing plant*

Saint-Gobain PAM Deutschland GmbH  
Saarbrücker Straße 51  
66130 Saarbrücken  
DEUTSCHLAND

Diese Zulassung umfasst  
*This Approval contains*

13 Seiten einschließlich 5 Anhänge  
*13 pages including 5 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<sup>1</sup>, modified by Council Directive 93/68/EEC<sup>2</sup> and Regulation (EC) N° 1882/2003 of the European Parliament and of the Council<sup>3</sup>;
  - *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<sup>4</sup>, as amended by Article 2 of the law of 8 November 2011<sup>5</sup>;*
  - Common Procedural Rules for Requesting, Preparing and the Granting of European technical approvals set out in the Annex to Commission Decision 94/23/EC<sup>6</sup>.
- 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.

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

PAM-ductilepile is a ductile iron tubular pile pipe (spheroidal graphite cast iron) with spigot end and conical socket, which is joined together to a flexible choice of pile length. The conical socket and the spigot end form those parts of the pile pipe which ensure a proper and easily connection of pile pipes for pile units. When driven they form a rigid connection with resistance to axial compressive forces.

Pile pipes are manufactured in standards 5 m up to 6 m with external diameters of 118 mm or 170 mm and defined wall thickness.

Type 118: Nominal external diameter = 118 mm, nominal wall thickness = 7.5 mm or 9.0 mm

Type 170: Nominal external diameter = 170 mm, nominal wall thickness = 9.0 mm or 10.6 mm

A drawing of the pile pipes, the dimensions of the pile pipes and the dimension tolerances are given in Annex 2.

Pile pipes are a component of completed piles.

*Note: Completed piles are not part of this European technical approval. Design and assembly (execution) of the completed piles are not covered by this European technical approval. National regulations for the completed piles are at the field of responsibility of the Member States unless European technical specifications, i.e. harmonised European standards or European technical approvals, for the completed piles are available.*

#### 1.2 Intended use

PAM-ductilepile is used for piles for foundation of buildings, for foundation of civil engineering works, for foundation of pipeline constructions etc., which are designed for loading by axial compressive forces only.

The intended use is predominantly for static loads.

Due to resilient properties of ductile iron impact does not influence the product till ambient temperatures of -20 °C and above.

PAM-ductilepile is used in soils with or without groundwater with the exception of non-compacted and aggressive fills (e.g. ashes, slag).

*Note: Pile pipes which are used for grout piles are not covered by this European technical approval.*

The provisions made in this European technical approval are based on an assumed intended working life of PAM-ductilepile for the intended use of 100 years, provided that the product is subject to appropriate use. The indications given on the working life cannot be interpreted as a guarantee given by the producer or the approval body, but are to be regarded only as a means for choosing the appropriate product in relation to the expected, economically reasonable working life of the works.

## 2 Characteristics of the product and methods of verification

### 2.1 Characteristica of the product

#### 2.1.1 Mechanical resistance and stability (ER 1)

##### 2.1.1.1 Material properties

The material properties of ductile iron are given in Annex 1.

##### 2.1.1.2 Dimensions (including tolerances)

The dimensions of the pile pipes and the dimension tolerances are given in Annex 2.

##### 2.1.1.3 Internal load bearing capacity

The maximum permissible axial internal load bearing capacities of the pile pipes are given in Annex 3.

#### 2.1.2 Hygiene, health and the environment (ER 3)

##### 2.1.2.1 Release of dangerous substances

PAM-ductilepile complies with the provisions of Guidance Paper H<sup>7</sup>/EU data-base about dangerous substances.

A declaration of conformity in this respect was made by the manufacturer.

In addition to the specific clauses relating to dangerous substances contained in this European technical approval, there may be other requirements applicable to the product falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the EC Construction Products Directive, these requirements need also to be complied with, when and where they apply.

#### 2.1.3 Durability and serviceability

##### 2.1.3.1 Resistance to corrosion

The reduced internal load bearing capacities of the pile pipes in consideration of thickness losses due to corrosion of 3 mm of the external diameter are given in Annex 3.

## 2.2 Methods of verification

### 2.2.1 General

The assessment of the fitness of PAM-ductilepile for the intended use in relation to the requirements for mechanical resistance and stability (ER1), hygiene, health and the environment (ER 3) and durability and serviceability has been made in accordance with sections 2.2.2, 2.2.3 and 2.2.4.

#### 2.2.2 Essential requirement N<sup>o</sup> 1: Mechanical resistance and stability

Material properties, dimensions and internal load bearing capacity are given in Annexes 1, 2 and 3.

#### 2.2.3 Essential requirement No 3: Hygiene, health and environment

PAM-ductilepile complies with the provisions of Guidance Paper H<sup>7</sup>/EU data-base about dangerous substances.

#### 2.2.4 Durability and serviceability

The reduced internal load bearing capacities of the pile pipes in consideration of thickness losses due to corrosion are given in Annex 3.

<sup>7</sup> Guidance Paper H: A harmonised approach relating to dangerous substances under the Construction Products Directive, edition 2002

### 3 Evaluation and attestation of conformity and CE marking

#### 3.1 System of attestation of conformity

According to the communication of the European Commission<sup>8</sup> the same system of attestation of conformity as given in the related Commission Decision 98/214/EC<sup>9</sup> for structural metallic sections/profiles, system 2+ according to Council Directive 89/106/EEC, Annex III, section 2 (ii), first possibility, applies and is detailed 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.

#### 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. 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.

As part of the of factory production control the manufacturer carries out tests and controls in accordance with the control plan<sup>10</sup> which is fixed with this European technical approval.

Details of the extent, nature and frequency of testing and controls to be performed within the factory production control correspond to this control plan which is part of the technical documentation of this European technical approval.

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

The records shall include at least the following information:

- Designation of the products and of the basic materials
- Type of control or testing
- Date of manufacture of the products and date of testing of the products or basic materials

<sup>8</sup> Letter of the European Commission of 25/01/2005 to EOTA

<sup>9</sup> Official Journal of the European Communities L 80 of 18/03/1998

<sup>10</sup> 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 the attestation of conformity. See section 3.2.2.

- Result of control and testing and, if appropriate, comparison with requirements
- Name and signature of person responsible for factory production control

The records shall be presented to the approved body involved in continuous surveillance. On request the records must be presented to the Deutsches Institut für Bautechnik.

### 3.2.1.2 Other tasks for the manufacturer

#### 3.2.1.2.1 Initial type-testing of the product

For initial type-testing the results of the tests performed as part of the assessment for the European technical approval may be used unless there are changes in the manufacture or manufacturing plant. In such cases the necessary initial type-testing has to be agreed between the Deutsches Institut für Bautechnik and the approved body involved.

#### 3.2.1.2.2 Testing of samples taken at the factory

In the framework of factory production control the manufacturer carries out tests in accordance with the control plan which is fixed with this European technical approval.

Details of the extent, nature and frequency of testing to be performed within the factory production control correspond to this control plan which is part of the technical documentation of this European technical approval.

#### 3.2.1.2.3 Declaration of conformity

When all the criteria of the conformity attestation are satisfied the manufacturer shall make a declaration of conformity.

## 3.2.2 Tasks for the approved bodies

### 3.2.2.1 Initial inspection of factory and of factory production control

The approved body shall ascertain that, in accordance with the control plan, the manufacturing plant, in particular personnel and equipment, and the factory production control are suitable to ensure a continuous and orderly manufacturing of PAM-ductilepile according to the specifications given in clause 2 and in the Annexes of this European technical approval.

### 3.2.2.2 Continuous surveillance, assessment and approval of factory production control

The approved body shall visit the factory at least once a year for surveillance of the manufacturer.

It has to be verified that the system of factory production control and the specified manufacturing process are maintained taking into account the control plan.

Continuous surveillance and assessment of factory production control have to be performed according to the control plan.

The results of continuous surveillance shall be made available on demand by the approved body or Deutsches Institut für Bautechnik.

### 3.2.2.3 Certification

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 letters "CE" shall correspond to the Council Directive 93/68/EEC. A simplified CE marking shall be affixed on the product itself and the CE marking with the complete accompanying information shall be affixed on a label attached to the packaging.

The simplified CE marking affixed on the product shall be accompanied by the following information:

- Number of the European technical approval

The CE marking affixed on a label attached to the packaging shall be accompanied by the following information:

- Identification number of the notified certification body
- Name and address or identifying mark of the producer
- Last two digits of the year in which the CE marking was affixed
- Number of the EC certificate of conformity of the factory production control
- Number of the European technical approval
- Dangerous substances as far as relevant
- Type of pile pipe (nominal external diameter)
- Nominal wall thickness

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

### 4.1 Manufacturing

PAM-ductilepile is manufactured in accordance with the provisions of this European technical approval using the manufacturing process as identified in the inspection of the manufacturing plant by the approval body and laid down in the technical documentation.

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

#### 4.2.1 Design

Piles made of pile pipes shall be calculated in accordance with EN 1992-1-1+AC:2010<sup>11</sup>, EN 1997-1+AC2009<sup>12</sup> and EN 1997-2+AC:2010<sup>13</sup>.

*Note: The design of the completed piles is not covered by this European technical approval. The design of the completed piles is subject to national requirements and regulations.*

11	EN 1992-1-1 +AC:2010	Eurocode 2: Design of concrete structures - Part 1-1: General rules and rules for buildings
12	EN 1997-1 +AC:2009	Eurocode 7: Geotechnical design - Part 1: General rules
13	EN 1997-2 +AC:2010	Eurocode 7: Geotechnical design - Part 2: Design assisted by laboratory testing

#### 4.2.2 Installation

The installation and execution of piles made of pile pipes shall be in accordance with EN 14199<sup>14</sup> as far as national regulations admit it.

Completed piles made of pile pipes consist of a pile shoe, pile pipes, a pile head and a pile shaft.

Pile shoes form the first component of piles and serve to prevent the ingress of material into the pile shaft. Flat pile shoes are used in soft soils and conical shoes for penetrating more compact soils and stony ground. The first pile pipe to be driven is fitted with a pile shoe for driving into the soil. When driven the pile pipes form a rigid connection with resistance to compressive forces. The pile pipes are driven to a depth at which the subsoil offers adequate driving resistance for the required load bearing capacity. That permits load bearing capacity to be monitored for each individual pile. The excess length of pile pipes can be cut off and re-used. After driving the joined tubular piles to the end depth, they are filled with concrete to increase the internal load bearing capacity. Pile heads are on top of the piles and serve to transmit forces from buildings into the piles.

The maximum inclination to the vertical of the completed piles and the minimum distances between the completed piles shall be observed.

Pile pipes made of ductile iron can be driven till ambient temperatures of -20 °C and above. Pile pipes made of ductile iron must not be installed at ambient temperatures below -20 °C.

It is not the responsibility of the manufacturer to deliver a manual for installation of the completed piles.

*Note: The assembly (execution) of the completed piles is not covered by this European technical approval. The installation and execution of the completed piles are subject to national requirements and regulations.*

### 5 Indications to the manufacturer

#### 5.1 Packaging, transport and storage

PAM-ductilepile shall be handled and stored with care, protected from accidental damage.

Pile pipes made of ductile iron are bundled with straps for transport and storage. Provisions regarding storage valid in the intended place of use shall be followed.

#### 5.2 Use, maintenance, repair

Maintenance of PAM-ductilepile is not required.

Andreas Kummerow  
p. p. Head of Department

*beglaubigt:*  
Hahn



**Table 1.1: Material properties of ductile iron**

Material property	Method of verification <sup>1)</sup>	Performance/ Value
Tensile strength	EN 545, clause 6.3	$\geq 420 \text{ N/mm}^2$
Breaking elongation	EN 545, clause 6.3	$\geq 10 \%$
Brinell hardness	EN 545, clause 6.4	$\leq 230 \text{ HB}$
Yield strength 0,2 % ( $R_{p0,2}$ )	EN 545, clause 6.3, and EN ISO 6892-1	$\geq 300 \text{ N/mm}^2$
Charpy notch energy (V-notch) at a temperature of -20°C	EN ISO 148-1	$\geq 10 \text{ J}$
Chemical composition Carbon (C) Silicon (Si) Manganese (Mn) Phosphorus (P) Sulphur (S) Magnesium (Mg)	Directional analysis / spectral analysis	3,4 - 3,8 % 2,2 - 2,7 % < 0,5 % < 0,1 % < 0,01 % 0,02 - 0,05 % <sup>2)</sup>
<sup>1)</sup> Reference documents are listed in Annex 4 <sup>2)</sup> Content of magnesium (Mg) is related only to the content in solid state of ductile iron.		

According to the verified values given in Table 1.1, the values given in Table 1.2 can be used for further calculation.

**Table 1.2**

Material property	Performance/Value
Compressive strength	700 N/ mm <sup>2</sup>
Modulus of elasticity	164 000 - 176 000 N/ mm <sup>2</sup>
Density	7050 kg/ m <sup>3</sup>

PAM-ductilepile

Material properties

Annex 1

Figure 2.1

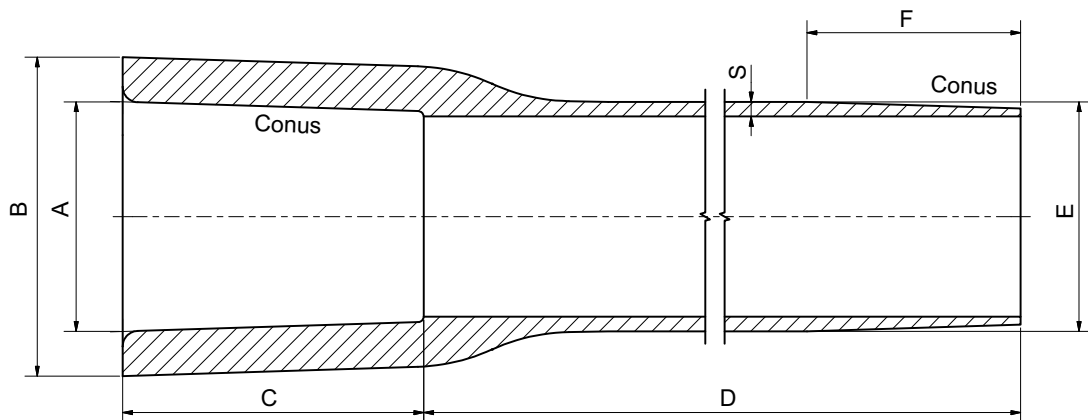


Table 2.1: Dimensions of pile pipe and dimension tolerances

Dimension	Method of verification <sup>1)</sup>	Type 118		Type 170	
		7,5	9,0	9,0	10,6
<b>SOCKET</b>					
Internal diameter A	EN 545, clause 6.1.3	118,5 mm ± 0,5 mm	118,5 mm ± 0,5 mm	171,5 mm ± 0,5 mm	171,5 mm ± 0,5 mm
External diameter B	EN 545, clause 6.1.2	≥ 162 mm	≥ 162 mm	≥ 220 mm	≥ 220 mm
Conus	EN 545, clauses 6.1.2 and 6.1.3	1:10 - 1:18	1:10 - 1:18	1:12 - 1:18	1:12 - 1:18
Conus length C	EN 545, clause 6.1.4	155 mm ± 1,0 mm	155 mm ± 1,0 mm	215 mm ± 1,0 mm	215 mm ± 1,0 mm
<b>PILE PIPE SHAFT</b>					
External diameter E	EN 545, clause 6.1.2	118 mm + 1,5 mm/ - 1,0 mm	118 mm + 1,5 mm/ - 1,0 mm	170 mm + 2,5 mm/ - 1,0 mm	170 mm + 2,5 mm/ - 1,0 mm
Wall thickness S	EN 545, clause 6.1.1	7,5 mm - 0,8 mm	9,0 mm - 0,8 mm	9,0 mm - 0,8 mm	10,6 mm - 0,8 mm
Pile pipe length D	EN 545, clause 6.1.4	5000 mm ± 100 mm up to 6000 mm ± 100 mm	5000 mm ± 100 mm up to 6000 mm ± 100 mm	5000 mm ± 100 mm up to 6000 mm ± 100 mm	5000 mm ± 100 mm up to 6000 mm ± 100 mm
Straightness	EN 545, clause 6.2	≤ 0,125 % of the pile pipe length	≤ 0,125 % of the pile pipe length	≤ 0,125 % of the pile pipe length	≤ 0,125 % of the pile pipe length
<sup>1)</sup> Reference documents are listed in Annex 4.					

Note: Table 2.1 is continued on page 12

PAM-ductilepile

Dimensions (including tolerances)

Annex 2.1

**Table 2.1: Dimensions of pile pipe and dimension tolerances continuation)**

Dimension	Method of verification <sup>1)</sup>	Type 118		Type 170	
		7,5	9,0	9,0	10,6
<b>SPIGOT END</b>					
Conus	EN 545, clauses 6.1.2 and 6.1.3	1:10 - 1:18	1:10 - 1:18	1:12 - 1:18	1:12 - 1:18
External diameter E	EN 545, clause 6.1.2	118 mm +1,5 mm/ - 1,0 mm	118 mm + 1,5 mm/ - 1,0 mm	170 mm + 2,5 mm/ - 1,0 mm	170 mm + 2,5 mm/ - 1,0 mm
Conus length F	EN 545, clause 6.1.4	110 mm - 20,0 mm	110 mm - 20,0 mm	150 mm - 20,0 mm	150 mm - 20,0 mm
<sup>1)</sup> Reference documents are listed in Annex 4.					

**Table 3.1: Internal load bearing capacity and reduced internal bearing capacity**

Type	Nominal wall thickness	Method of verification	Safety coefficient	Maximum permissible axial internal load bearing capacity	Reduced internal load bearing capacity <sup>2)</sup>
Type 118	7,5 mm	Calculation	1,5 <sup>1)</sup>	521 KN	411 KN
Type 118	9,0 mm	Calculation	1,5 <sup>1)</sup>	616 KN	507 KN
Type 170	9,0 mm	Calculation	1,5 <sup>1)</sup>	910 KN	752 KN
Type 170	10,6 mm	Calculation	1,5 <sup>1)</sup>	1062 KN	903 KN

<sup>1)</sup> As far as binding national regulations do not define higher values.  
<sup>2)</sup> In consideration of thickness losses due to corrosion of 3 mm of the external diameter.

PAM-ductilepile

Internal load bearing capacity

Annex 3

### Reference documents

EN 545: 2010

Ductile iron pipes, fittings, accessories and their joints for water pipelines - Requirements and test methods

EN ISO 6892-1: 2009

Metallic materials - Tensile testing - Part 1: Method of test at room temperature

EN ISO 148-1: 2010

Metallic materials - Charpy pendulum impact test - Part 1: Test method

PAM-ductilepile	Annex 4
Reference documents	