



## European Technical Approval ETA-05/0070

English translation prepared by DIBt - Original version in German language

Handelsbezeichnung  
*Trade name*

mungo Stahlbolzen m2, m2C  
*mungo Throughbolt m2, m2C*

Zulassungsinhaber  
*Holder of approval*

Mungo Befestigungstechnik AG  
Bornfeldstrasse 2  
4603 Olten  
SCHWEIZ

Zulassungsgegenstand  
und Verwendungszweck

Kraftkontrolliert spreizender Dübel aus galvanisch verzinktem Stahl in  
den Größen M6, M8, M10, M12, M16 und M20 zur Verankerung im  
ungerissenen Beton

*Generic type and use  
of construction product*

*Torque-controlled expansion anchor made of galvanised steel of sizes  
M6, M8, M10, M12, M16 an M20 for use in non-cracked concrete*

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

22 February 2012  
23 April 2015

Herstellwerk  
*Manufacturing plant*

Mungo Werk Olten

Diese Zulassung umfasst  
*This Approval contains*

12 Seiten einschließlich 5 Anhänge  
*12 pages including 5 annexes*

Diese Zulassung ersetzt  
*This Approval replaces*

ETA-05/0070 mit Geltungsdauer vom 23.04.2010 bis 23.04.2015  
*ETA-05/0070 with validity from 23.04.2010 to 23.04.2015*

## 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 law of 31 October 2006<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>;
  - Guideline for European technical approval of "Metal anchors for use in concrete - Part 2: Torque controlled expansion anchors ", ETAG 001-02.
- 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 2006*, p. 2407, 2416  
<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

The mungo Throughbolt m2, m2C in the range of M6, M8, M10, M12, M16 and M20 is an anchor made of galvanised steel which is placed into a drilled hole and anchored by torque-controlled expansion.

An illustration of the product and intended use is given in Annex 1.

#### 1.2 Intended use

The anchor is intended to be used for anchorages for which requirements for mechanical resistance and stability and safety in use in the sense of the Essential Requirements 1 and 4 of Council Directive 89/106 EEC shall be fulfilled and failure of anchorages made with these products would cause risk to human life and/or lead to considerable economic consequences. The anchor is to be used only for anchorages subject to static or quasi-static loading in reinforced or unreinforced normal weight concrete of strength classes C20/25 at minimum and C50/60 at most according to EN 206: 2000-12. It may be anchored in non-cracked concrete only.

The anchor may only be used in structures subject to dry internal conditions.

The provisions made in this European technical approval are based on an assumed intended working life of the anchor of 50 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 product

The anchor corresponds to the drawings and provisions given in Annex 2. The characteristic material values, dimensions and tolerances of the anchor not indicated in Annex 2 shall correspond to the respective values laid down in the technical documentation<sup>7</sup> of this European technical approval.

The characteristic anchor values for the design of anchorages are given in Annexes 3 to 5.

Each anchor is marked with the identifying mark of the producer included the anchor identity, the thread size, the length of the anchor and the maximum thickness of fixture corresponding Annex 1.

The anchor shall only be packaged and supplied as a complete unit.

<sup>7</sup> The technical documentation of this European technical approval is deposited at the Deutsches Institut für Bautechnik and, as far as relevant for the tasks of the approved bodies involved in the attestation of conformity procedure, is handed over to the approved bodies.

## 2.2 Methods of verification

The assessment of fitness of the anchor for the intended use in relation to the requirements for mechanical resistance and stability and safety in use in the sense of the Essential Requirements 1 and 4 has been made in accordance with the "Guideline for European technical approval of Metal Anchors for use in concrete", Part 1 "Anchors in general" and Part 2 "Torque-controlled expansion anchors" on the basis of Option 7.

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

## 3 Evaluation and attestation of conformity and CE marking

### 3.1 System of attestation of conformity

According to the Decision 96/582/EG of the European Commission<sup>8</sup> the system 2(i) (referred to as system 1) of attestation of conformity applies.

This system of attestation of conformity is defined as follows:

System 1: Certification of the conformity of the product by an approved certification body on the basis of:

- (a) Tasks for the manufacturer:
  - (1) factory production control;
  - (2) further testing of samples taken at the factory by the manufacturer in accordance with a control plan;
- (b) Tasks for the approved body:
  - (3) initial type-testing of the product;
  - (4) initial inspection of factory and of factory production control;
  - (5) 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/raw/constituent materials stated in the technical documentation of this European technical approval.

<sup>8</sup> Official Journal of the European Communities L 254 of 08.10.1996.

The factory production control shall be in accordance with the control plan which is part of this 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<sup>9</sup>.

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 anchors in order to undertake the actions laid down in section 3.2.2 For this purpose, the control plan referred to in sections 3.2.1.1 and 3.2.2 shall be handed over by the manufacturer to the approved body involved.

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

#### 3.2.2 Tasks for the approved bodies

The approved body shall perform the

- initial type-testing of the product,
  - 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 product 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 anchor. 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 of conformity for the product,
- the number of the European technical approval,
- the number of the guideline for European technical approval,
- use category (ETAG 001-1 Option 7),
- size.

<sup>9</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 attestation of conformity. See section 3.2.2.

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

##### **4.1 Manufacturing**

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

##### **4.2 Design of anchorages**

The fitness of the anchor for the intended use is given under the following conditions:

The anchorages are designed in accordance with the "Guideline for European technical approval of Metal Anchors for Use in Concrete", Annex C, Method A, under the responsibility of an engineer experienced in anchorages and concrete work.

Verifiable calculation notes and drawings are taking account of the loads to be anchored.

The position of the anchor is indicated on the design drawings (e.g. position of the anchor relative to reinforcement or to supports).

##### **4.3 Installation of anchors**

The fitness for use of the anchor can only be assumed if the anchor is installed as follows:

- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site,
- Use of the anchor only as supplied by the manufacturer without exchanging the components of an anchor,
- Anchor installation in accordance with the manufacturer's specifications and drawings and using the appropriate tools,
- Checks before placing the anchor to ensure that the strength class of the concrete in which the anchor is to be placed is in the range given and is not lower than that of the concrete to which the characteristic loads apply,
- Check of concrete being well compacted, e.g. without significant voids,
- Positioning of the drill holes without damaging the reinforcement,
- Drill hole by hammer drilling only,
- Cleaning of the hole of drilling dust,
- Edge distances and spacing not less than the specified values without minus tolerances,
- Anchor installation such that the effective anchorage depth is complied with. This compliance is ensured when the embedment mark of the anchor does not more exceed the concrete surface,
- In case of aborted hole: new drilling at a minimum distance away of twice the depth of the aborted hole or smaller distance if the aborted drill hole is filled with high strength mortar and if under shear or oblique tension load it is not in the direction of load application,
- Application of the torque moment given in Annex 3 using a calibrated torque wrench.

## 5 Responsibility of the manufacturer

The manufacturer is responsible to ensure that the information on the specific conditions according to 1 and 2 including Annexes referred to and 4.2 and 4.3 is given to those who are concerned. This information may be made by reproduction of the respective parts of the European technical approval. In addition all installation data shall be shown clearly on the package and/or on an enclosed instruction sheet, preferably using illustration(s).

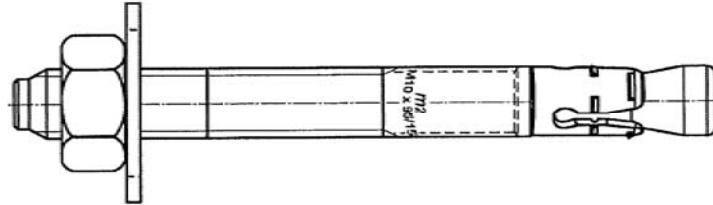
The minimum data required are:

- drill bit diameter;
- thread diameter;
- maximum thickness of the fixture;
- minimum effective anchorage depth;
- minimum hole depth;
- torque moment;
- information on the installation procedure, including cleaning of the hole, preferably by means of an illustration;
- reference to any special installation equipment needed;
- identification of the manufacturing batch.

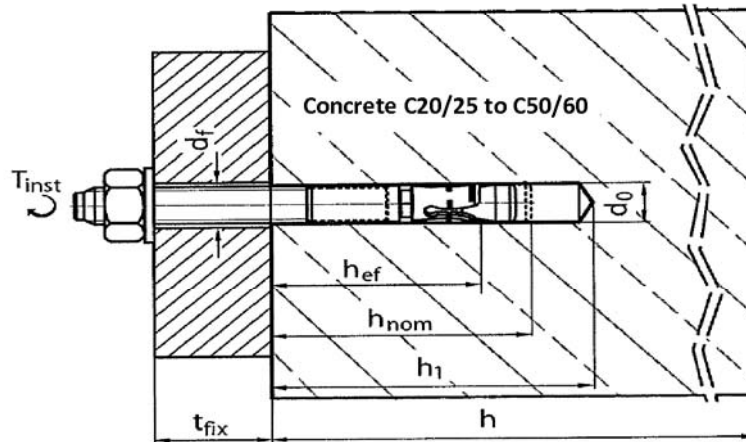
All data shall be presented in a clear and explicit form.

Georg Feistel  
Head of Department

*beglaubigt:*  
Bürger



		Marking	Designation
Example:	<b>m2</b>	<b>m2</b>	m2 Steel galvanised, Washer DIN 125/m2C Steel galvanised, Washer DIN 9021
	M6...M20	M6...M20	Nominal diameter
	x 65...440	x 65...440	Length of anchor
	/ 10...325	/ 10...325	Maximum fixture thickness



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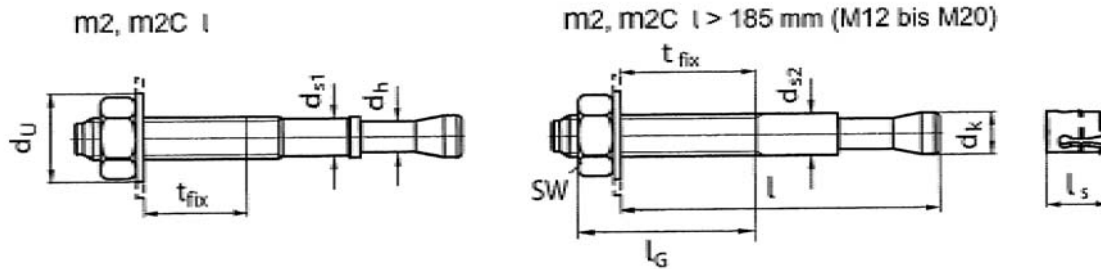
Annex 1

Product and intended use



**Table 1: Dimensions**

			M6	M8	M10	M12	M16	M20	
Bolt	$d_k$	[mm]	6	8	10	12	16	20	
	$d_h$	[mm]	4	5.6	7.3	8.7	11.5	15.2	
	$d_{s1}$	[mm]	5.25	7.05	8.9	10.7	14.5	-	
	$d_{s2}$	[mm]	-	-	-	12	16	20	
	min $t_{fix}$	[mm]	10	10	15	15	15	30	
	max $t_{fix}$	[mm]	40	95	100	265	325	140	
	min $l_G$	[mm]	32	43	52	62	73	100	
	max $l_G$	[mm]	62	120	120	120	120	120	
	min $l$	[mm]	65	80	95	110	130	160	
max $l$	[mm]	95	165	180	360	440	270		
Expansion sleeve	Type A	$l_s$	[mm]	9.5	12	14.2	16.8	19.3	21.6
	Type B			-	-	-	-	19.7	-
Washer	DIN 125	$d_u$	[mm]	12	16	20	24	30	37
	DIN 9021	$d_u$	[mm]	18	24	30	37	50	60
Hexagonal nut	SW	[mm]	10	13	17	19	24	30	



**Table 2: Materials**

Part	Designation	Material	
1	Bolt	Cold formed or machined steel galvanized $\geq 5 \mu\text{m}$ DIN 50961	
2a)	Expansion sleeve	Steel according to EN10088 1.4016 (Typ A; M6 bis M20)	
2b)		Steel according to EN10088 1.4401, 1.4404, 1.4016 (Typ B; M16)	
3	Washer	m2	DIN 125 ; Steel galvanized $\geq 5 \mu\text{m}$ ISO4042
		m2C	DIN 9021; Steel galvanized $\geq 5 \mu\text{m}$ ISO4042
4	Hexagonal nut	Steel strength grade 8 acc. EN20989-2 galvanized $\geq 5 \mu\text{m}$ ISO4042	

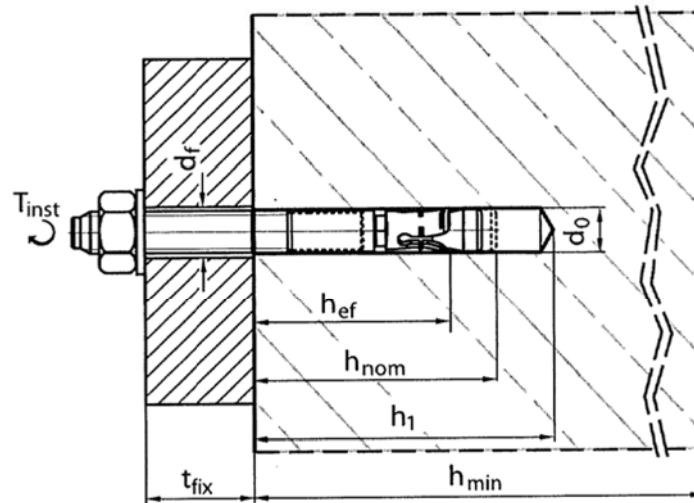
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Annex 2

Materials and dimension of anchors

**Table 3: Installation data**

			M6	M8	M10	M12	M16	M20
Nominal drill hole diameter	$d_0$	[mm]	6	8	10	12	16	20
Cutting diameter of drill bit	$d_{cut}$	[mm]	6,4	8,45	10,45	12,5	16,5	20,55
Torque moment	$T_{inst}$	[Nm]	5	15	30	50	100	200
Depth of drill hole	$h_1$	[mm]	60	65	80	90	110	130
Anchor embedment depth	$h_{nom}$	[mm]	46,9	58,5	68,8	79,6	96,4	118
Effective anchorage depth	$h_{ef}$	[mm]	40	50	58	68	80	100
Diameter of clearance hole in the fixture	$d_f$	[mm]	7	9	12	14	18	22



**Table 4: Minimum thickness of concrete member, minimum spacing and minimum edge distance**

Non-cracked concrete only			M6	M8	M10	M12 <sup>1)</sup>	M16 <sup>1)</sup>	M20
Minimum member thickness	$h_{min}$	[mm]	100	100	120	140	160	200
Minimum spacing	$s_{min}$	[mm]	40	50	60	75 (110)	100 (120)	200
	for c	[mm]	70	90	115	150 (200)	190 (320)	400
Minimum edge distance	$c_{min}$	[mm]	40	50	60	100 (150)	130 (240)	300
	for s	[mm]	80	100	120	150 (210)	190 (240)	350

<sup>1)</sup> The values in parentheses are valid for anchor length  $l > 185$  mm.

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**Annex 3**

**Installation data, minimum thickness of member,  
minimum spacing and edge distances**

**Table 5: Characteristic values to tension loads of design method A**

			M6	M8	M10	M12	M16	M20
<b>Steel failure</b>								
Characteristic resistance	$N_{Rk,s}$	[kN]	9.6	19.0	32.6	43.6	76.6	123.8
Partial safety factor	$\gamma_{MS}^{1)}$	[-]	1.4					
<b>Pull-out failure</b>								
Characteristic resistance in non-cracked concrete C20/25	$N_{Rk,p}$	[kN]	7.5	12	16	25	30	50
Partial safety factor	$\gamma_2$	[-]	1.0			1.2		
	$\gamma_{Mp}^{1) 2)}$	[-]	1.5			1.8		
Increasing factors for non-cracked concrete for $N_{Rk,p}$	C30/37	[-]	1.17					
	C40/50	[-]	1.32					
	C50/60	[-]	1.42					
<b>Concrete cone failure and splitting failure</b>								
Effective anchorage depth	$h_{ef}$	[mm]	40	50	58	68	80	100
Spacing	$s_{cr,N}$	[mm]	120	150	174	204	240	300
	$s_{cr,sp}$	[mm]	200	250	290	340	400	500
Edge distances	$c_{cr,N}$	[mm]	60	75	87	102	120	150
	$c_{cr,sp}$	[mm]	100	125	145	170	200	250
Partial safety factor	$\gamma_2$	[-]	1.0			1.2		
	$\gamma_{Mc} = \gamma_{M,sp}^{1) 2)}$	[-]	1.5			1.8		

<sup>1)</sup> In absence of other national regulations.

<sup>2)</sup> The installation safety factor  $\gamma_2$  is included.

**Table 6: Displacements under tension loads**

			M6	M8	M10	M12	M16	M20
Tension load in non-cracked concrete C20/25 to C50/60		[kN]	3.6	5.7	7.6	9.9	11.9	19.8
Displacement	$\bar{\delta}_{NO}$	[mm]	0.3					
	$\bar{\delta}_N$	[mm]	1.3					

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**Design method A, characteristic values of resistance to tension loads; displacements**

**Annex 4**

**Table 7: Characteristic values to shear loads of design method A**

			M6	M8	M10	M12	M16	M20
<b>Steel failure without lever arm</b>								
Characteristic resistance	$N_{Rk,s}$	[kN]	4.5	8.2	13.0	17.7	32.9	51.4
Partial safety factor	$\gamma_{MS}^{1)}$	[-]	1.5					
<b>Steel failure with lever arm</b>								
Characteristic resistance	$M_{Rk,s}$	[Nm]	12.2	30.0	59.8	98.2	249	486.2
Partial safety factor	$\gamma_{MS}^{1)}$	[-]	1.5					
<b>Concrete pryout failure</b>								
Factor in equation (5.6) of ETAG Annex C, § 5.2.3.3	k	[-]	1.0			2.0		
Partial safety factor	$\gamma_{Mc}^{1)}$	[-]	1.5					
<b>Concrete edge failure</b>								
Effective length of anchor in shear loading	$l_f$	[mm]	40	50	58	68	80	100
Diameter of anchor	$d_{nom}$	[mm]	6	8	10	12	16	20
Partial safety factor	$\gamma_{Mc}^{1)}$	[-]	1.5					

<sup>1)</sup> In absence of other national regulations.

**Table 8: Displacement under shear load**

			M6	M8	M10	M12	M16	M20
<b>Shear load in non-cracked concrete C20/25 to C50/60</b>		[kN]	1.9	3.5	5.5	7.5	14.0	21.9
Displacement	$\delta_{VO}$	[mm]	1.6	2.2	2.4	2.7	3.3	3.8
	$\delta_V$	[mm]	2.4	3.2	3.6	4.1	4.9	5.7

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**Design method A, characteristic values of resistance for shear load; displacements**

**Annex 5**