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Mitglied der EOTA
Member of EOTA

European Technical Approval ETA-06/0277

English translation prepared by DIBt - Original version in German language

Handelsbezeichnung

Trade name

Würth Schraubanker W-SA A4

Würth Screw Anchor W-SA A4

Zulassungsinhaber

Holder of approval

Adolf Würth GmbH & Co. KG

Reinhold-Würth-Straße 12-17
74653 Künzelsau
DEUTSCHLAND

**Zulassungsgegenstand
und Verwendungszweck**

*Generic type and use
of construction product*

Betonschraube aus nichtrostendem Stahl in den Größen 7,5,
10 und 12 zur Verankerung im Beton

*Concrete screw made of stainless steel of sizes 7.5, 10 and 12 for use in
concrete*

Geltungsdauer:

Validity:

vom
from
bis
to
verlängert vom
extended from
bis
to

3 July 2007

20 January 2010

20 January 2010

20 January 2015

Herstellwerk

Manufacturing plant

Herstellwerk W4, DEUTSCHLAND

Diese Zulassung umfasst

This Approval contains

14 Seiten einschließlich 7 Anhänge

14 pages including 7 annexes



Europäische Organisation für Technische Zulassungen
European Organisation for Technical Approvals

I LEGAL BASES AND GENERAL CONDITIONS

- 1 This European technical approval is issued by Deutsches Institut für Bautechnik in accordance with:
 - Council Directive 89/106/EEC of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products¹, modified by Council Directive 93/68/EEC² and Regulation (EC) N° 1882/2003 of the European Parliament and of the Council³;
 - Gesetz über das In-Verkehr-Bringen von und den freien Warenverkehr mit Bauprodukten zur Umsetzung der Richtlinie 89/106/EWG des Rates vom 21. Dezember 1988 zur Angleichung der Rechts- und Verwaltungsvorschriften der Mitgliedstaaten über Bauprodukte und anderer Rechtsakte der Europäischen Gemeinschaften (Bauproduktengesetz - BauPG) vom 28. April 1998⁴, as amended by law of 31 October 2006⁵;
 - Common Procedural Rules for Requesting, Preparing and the Granting of European technical approvals set out in the Annex to Commission Decision 94/23/EC⁶.
- 2 Deutsches Institut für Bautechnik is authorized to check whether the provisions of this European technical approval are met. Checking may take place in the manufacturing plant. Nevertheless, the responsibility for the conformity of the products to the European technical approval and for their fitness for the intended use remains with the holder of the European technical approval.
- 3 This European technical approval is not to be transferred to manufacturers or agents of manufacturers other than those indicated on page 1, or manufacturing plants other than those indicated on page 1 of this European technical approval.
- 4 This European technical approval may be withdrawn by Deutsches Institut für Bautechnik, in particular pursuant to information by the Commission according to Article 5(1) of Council Directive 89/106/EEC.
- 5 Reproduction of this European technical approval including transmission by electronic means shall be in full. However, partial reproduction can be made with the written consent of Deutsches Institut für Bautechnik. In this case partial reproduction has to be designated as such. Texts and drawings of advertising brochures shall not contradict or misuse the European technical approval.
- 6 The European technical approval is issued by the approval body in its official language. This version corresponds fully to the version circulated in EOTA. Translations into other languages have to be designated as such.

1 Official Journal of the European Communities N° L 40, 11 February 1989, p. 12

2 Official Journal of the European Communities N° L 220, 30 August 1993, p. 1

3 Official Journal of the European Union N° 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 N° L 17, 20 January 1994, p. 34

II SPECIFIC CONDITIONS OF THE EUROPEAN TECHNICAL APPROVAL

1 Definition of the construction product and intended use

1.1 Definition of the product

The Würth Screw Anchor W-SA A4 is an anchor made of stainless steel of sizes 7.5, 10 and 12. The anchor is screwed into a predrilled cylindrical drill hole. The special thread of the anchor cuts an internal thread into the member while setting. The anchorage is characterised by mechanical interlock in the special thread.

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 may be used for anchorages with requirements related to resistance to fire.

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 cracked and non-cracked concrete.

The anchor may be used in structures subject to dry internal conditions and also in structures subject to external atmospheric exposure (including industrial and marine environment), or exposure in permanently damp internal conditions, if no particular aggressive conditions exist. Such particular aggressive conditions are e.g. permanent, alternating immersion in seawater or the splash zone of seawater, chloride atmosphere of indoor swimming pools or atmosphere with extreme chemical pollution (e.g. in desulphurization plants or road tunnels where de-icing materials are used).

The provisions made in this European technical approval are based on an assumed 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 the product and methods of verification

2.1 Characteristics of the product

The anchor corresponds to the drawings and information 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 documentation⁷ of this European technical approval.

Regarding the requirements concerning safety in case of fire it is assumed that the anchor meets the requirements of class A1 in relation to reaction to fire in accordance with the stipulations of the Commission decision 96/603/EC, amended by 2000/605/EC.

⁷ 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.

The characteristic values for the design of the anchorages are given in Annex 4 and 5.

The characteristic values for the design of anchorages regarding resistance to fire are given in Annex 6. They are valid for use in a system that is required to provide a specific fire resistance class.

Each anchor shall be marked with the identifying mark of the producer, the anchor type, the diameter, the length of the anchor and the maximum thickness of fixture according to Annex 2.

2.2 Methods of verification

The assessment of the fitness of the anchor for the intended use with regard to the requirements of mechanical resistance and stability as well as safety in use in the sense of the Essential Requirements 1 and 4 was performed based on ETAG 001 "Guideline for European technical approval of Metal Anchors for Use in Concrete", Option 1, and the following additional tests:

1. Setting tests in high strength concrete;
2. Setting tests in low strength concrete;
3. Setting tests with impact screw driver;
4. Modified test under repeated loads;
5. Tests in respect to brittle fracture.

The assessment of the anchor for the intended use in relation to the requirements for resistance to fire has been made in accordance with the technical Report TR 020 "Evaluation of anchorages in concrete concerning resistance to fire".

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 communication of the European Commission⁸ the system 2+ of attestation of conformity applies.

This system of attestation of conformity is defined as follows:

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

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

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

⁸ Letter of the European Commission of 13/02/2004 to EOTA

3.2 Responsibilities

3.2.1 Tasks of 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.

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

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

3.2.1.2 Other tasks of 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 of 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 factory production control 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 anchors. 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 manufacturer),
- 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,

⁹ The control plan is a confidential part of the documentation of the European technical approval, but not published together with 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.

- use category (ETAG 001-1, Option 1),
- size.

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 European technical approval and consequently the validity of the CE marking on the basis of the European technical approval and if so whether further assessment or alterations to the European technical 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 prepared 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, in cracked or non-cracked concrete, etc.).

The design of anchorages under fire exposure has to consider the conditions given in the technical Report TR 020 "Evaluation of anchorages in concrete concerning resistance to fire". The relevant characteristic anchor values are given in Annex 6. The design method covers anchors with a fire attack from one side only. If the fire attack is from more than one side, the design method may be taken only, if the edge distance of the anchor is $c \geq 300$ mm.

4.3 Installation of anchors

The fitness for use of the anchor can only be assumed if the following conditions of installation are met:

- Anchor installation carried out by appropriately qualified personnel under the supervision of the person responsible for technical matters on site,
- Use of the anchor only as supplied by the manufacturer,
- Anchor installation in accordance with the manufacturer's specifications and drawings,
- Checks before placing the anchor, to ensure that the characteristic values of the base material in which the anchor is to be placed, is identical with the values, which the characteristic loads apply,
- Check of the concrete being well compacted, e.g. without significant voids,
- Edge distances and spacings not less than the specified values without minus tolerances,
- Placing drill holes without damaging the reinforcement,
- 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 hole is filled with high strength mortar and if under shear or oblique tension load it is not the direction of the load application,

- Cleaning of the hole of drilling dust,
- The anchor may be used only once,
- Anchor installation such that the embedment depth of the anchor in the concrete is not smaller than the value h_{nom} given in Annex 3, Table 2,
- The fixture is fully pressed on the concrete surface without intermediate layers,
- Further turning of the anchor is not easy,
- The head of the anchor is fully supported on the fixture and is not damaged.

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 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 packaging and/or on an enclosed instruction sheet, preferably using illustrations.

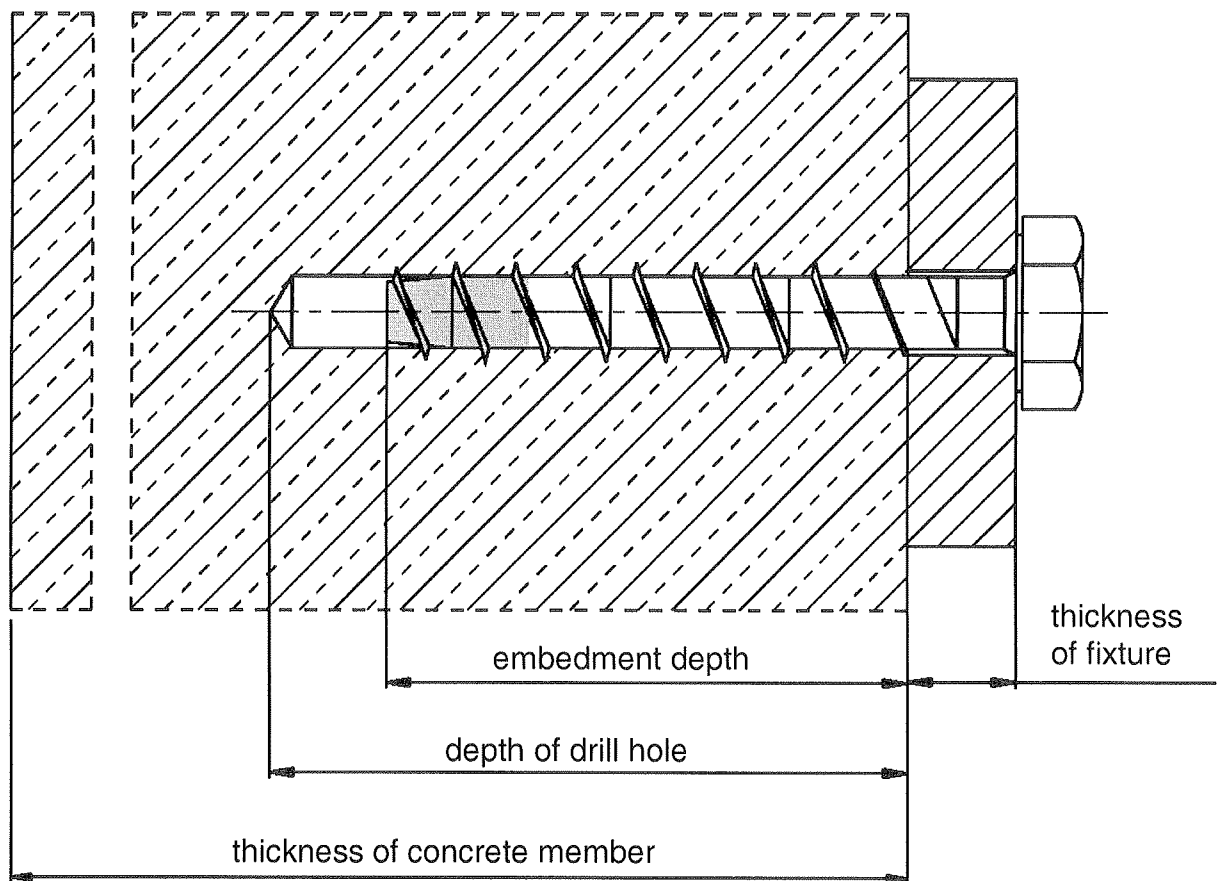
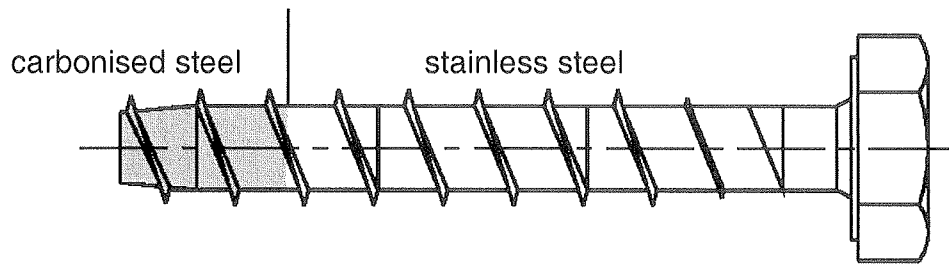
The minimum data required are:

- Drill bit diameter,
- Size of the anchor,
- Maximum thickness of the fixture,
- Minimum embedment depth,
- Minimum hole depth,
- 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.

Dipl.-Ing. Georg Feistel
Head of Division Construction Engineering
of Deutsches Institut für Bautechnik
Berlin, 20 January 2010

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Tempel



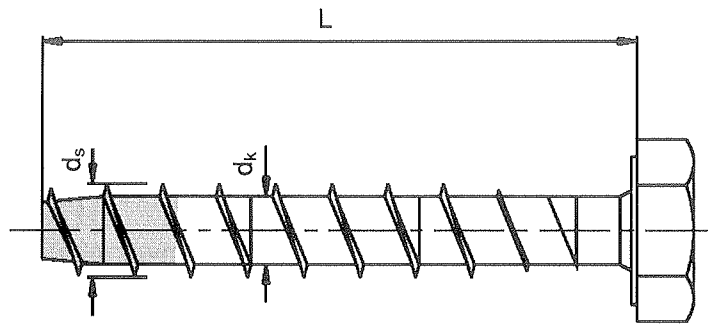
Würth Screw Anchor W-SA A4

Product and intended use

Annex 1

of European
technical approval

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Head versions

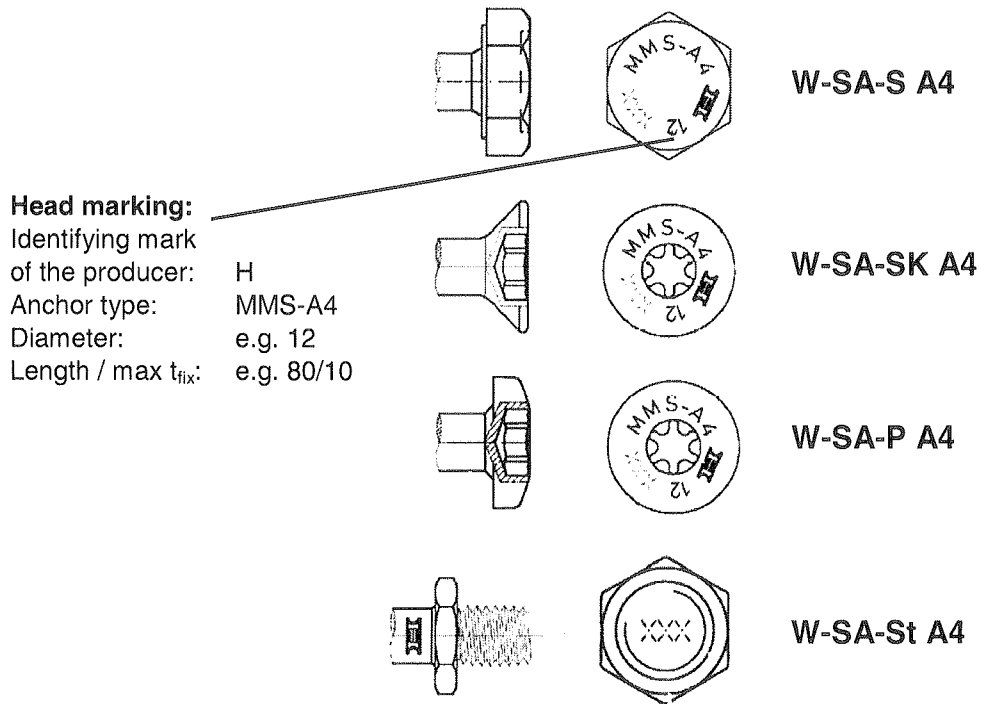


Table 1: Dimensions and materials

Anchor size			Ø 7.5	Ø 10	Ø 12
Length	L ≥	[mm]	70	80	90
	L ≤	[mm]	160	160	320
Bolt diameter	d _k	[mm]	5.7	7.6	9.6
Thread diameter	d _s	[mm]	7.5	10.1	12.4
Material			stainless steel 1.4401 and 1.4571 acc. to EN 10263-5		
Material of the tip			steel acc. to EN 10263-4		

Würth Screw Anchor W-SA A4

Head versions;
 Dimensions and materials

Annex 2

of European
 technical approval

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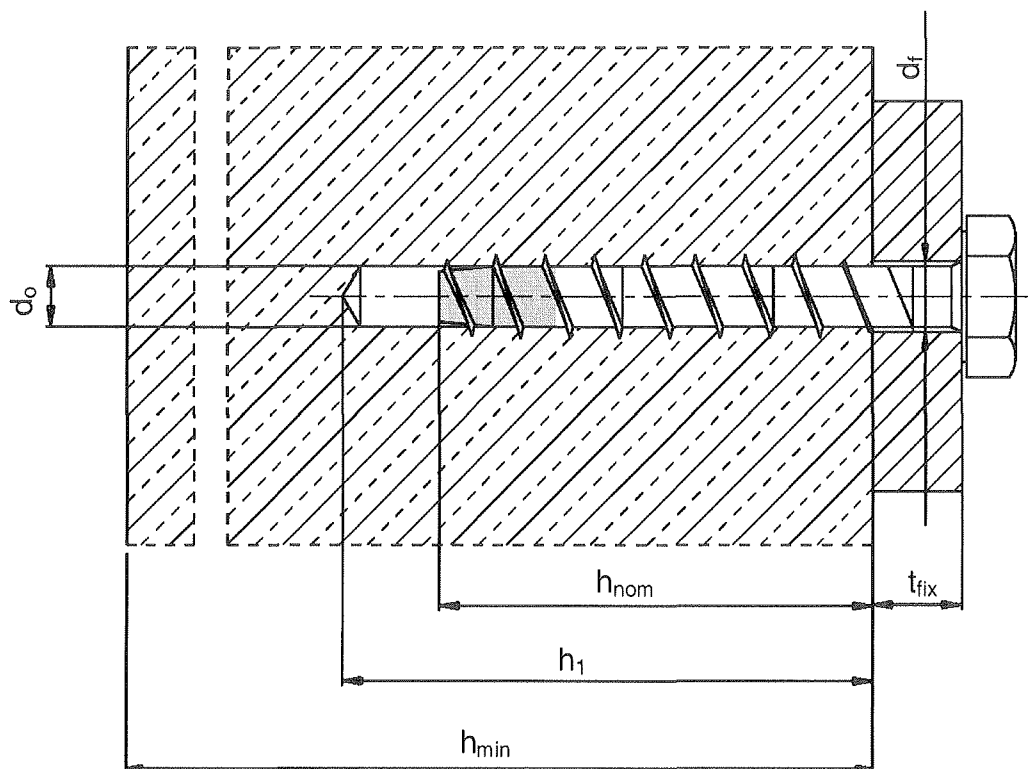


Table 2: Installation parameters

Anchor size		Ø 7.5	Ø 10	Ø 12
Nominal drill diameter	d_0 [mm]	6.0	8.0	10.0
Cutting diameter of the drill bit	$d_{cut} \leq$ [mm]	6.4	8.45	10.45
Depth of drill hole	$h_1 \geq$ [mm]	75	90	100
Embedment depth	$h_{nom} \geq$ [mm]	65	75	90
Diameter of clearance hole in the fixture	$d_f \leq$ [mm]	9.0	12.0	14.0

Table 3: Minimum thickness of concrete member, minimum spacing and minimum edge distances of anchors

Anchor size		Ø 7.5	Ø 10	Ø 12
Minimum thickness of the concrete member	h_{min} [mm]	105	130	140
Cracked and non-cracked concrete				
Minimum spacing	$s_{min} =$ [mm]	40	50	60
Minimum edge distance	$c_{min} =$ [mm]	40	50	60

Würth Screw Anchor W-SA A4

Installation parameters;
Minimum thickness of concrete member,
Minimum spacing and edge distances

Annex 3

of European
technical approval

ETA-06/0277

Table 4: Characteristic values of resistance to tension loads for design method A

Anchor size			Ø 7.5	Ø 10	Ø 12
Steel failure					
Characteristic resistance	$N_{Rk,s}$	[kN]	23	16	25
Partial safety factor	$\gamma_{Ms}^{1)}$	[-]	1.4		
Pullout					
Characteristic resistance in cracked concrete C20/25	$N_{Rk,p}$	[kN]	5	9	12
Characteristic resistance in non-cracked concrete C20/25	$N_{Rk,p}$	[kN]	7.5	12	16
Increasing factor for $N_{Rk,p}$ in cracked and non-cracked concrete	Ψ_C	C30/37	1.22		
		C40/50	1.41		
		C50/60	1.55		
Partial safety factor	$\gamma_{Mp}^{1)}$	[-]	2.1 ³⁾	1.8 ²⁾	
Concrete cone failure, splitting failure					
Effective anchorage depth	h_{ef}	[mm]	40	47.5	54.5
Spacing $s_{cr,N} = s_{cr,sp}$	$s_{cr,N}$	[mm]	3 h_{ef}		
Edge distance $c_{cr,N} = c_{cr,sp}$	$c_{cr,N}$	[mm]	1.5 h_{ef}		
Partial safety factor	$\gamma_{Mc}^{1)}$	[-]	2.1 ³⁾	1.8 ²⁾	

¹⁾ in absence of other national regulations

²⁾ the installation safety factor $\gamma_2 = 1.2$ is included

³⁾ the installation safety factor $\gamma_2 = 1.4$ is included

Table 5: Displacements under tension loads

Anchor size			Ø 7.5	Ø 10	Ø 12
Tension load in cracked concrete	N	[kN]	1.7	3.0	4.0
Displacement	δ_{N0}	[mm]	0.1	0.1	0.2
	$\delta_{N\infty}$	[mm]	0.2	0.2	0.6
Tension load in non-cracked concrete	N	[kN]	2.6	4.0	5.3
Displacement	δ_{N0}	[mm]	0.1	0.1	0.2
	$\delta_{N\infty}$	[mm]	0.2	0.2	0.6

Würth Screw Anchor W-SA A4

Design method A
Characteristic values to tension loads;
Displacements

Annex 4

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Table 6: Characteristic values of resistance to shear loads for design method A

Anchor size			Ø 7.5	Ø 10	Ø 12
Steel failure without lever arm					
Characteristic resistance	$V_{Rk,s}$	[kN]	12.3	20	33
Partial safety factor	$\gamma_{Ms}^{1)}$	[-]	1.5		
Steel failure with lever arm					
Characteristic anchor resistance	$M_{Rk,s}^0$	[Nm]	22	45	93
Partial safety factor	$\gamma_{Ms}^{1)}$	[-]	1.5		
Concrete pryout failure					
Factor in equation 5.6 of ETAG 001, Annex C, section 5.2.3.3	k	[-]	1.0	2.0	
Partial safety factor	$\gamma_{Mc}^{1)}$	[-]	1.5 ²⁾		
Concrete edge failure					
Effective length of the anchor in shear loading	l_f	[mm]	40	47.5	54.5
Effective diameter of the anchor	d_{nom}	[mm]	6	8	10
Partial safety factor	$\gamma_{Mc}^{1)}$	[-]	1.5 ²⁾		

¹⁾ in absence of other national regulations

²⁾ the installation safety factor $\gamma_2 = 1.0$ is included

Table 7: Displacements under shear loads

Anchor size			Ø 7.5	Ø 10	Ø 12
Shear load in cracked and non-cracked concrete	V	[kN]	5.9	9.7	15.7
Displacement	δ_{v0}	[mm]	1.7	3.0	3.2
	$\delta_{v\infty}$	[mm]	2.6	4.5	4.8

Information for design of anchorage under shear load:

In general, the conditions given in ETAG 001 Annex C, section 4.2.2.1 a) and section 4.2.2.2 b) are not fulfilled because the diameter of clearance hole in the fixture according to Annex 3, Table 2 is greater than the values given in Annex C, Table 4.1 for the corresponding diameter of the anchor. However for each specific anchor length the manufacturer may specify the thickness of fixture for which these conditions are fulfilled.

Würth Screw Anchor W-SA A4

Design method A
Characteristic values to shear loads;
Displacements

Annex 5

of European
technical approval

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Table 8: Characteristic values to tension loads under fire exposure in cracked and non-cracked concrete C20/25 to C50/60

Anchor size			Ø 7.5				Ø 10				Ø 12			
Fire resistance duration	R	[min]	30	60	90	120	30	60	90	120	30	60	90	120
Steel failure														
Characteristic resistance	$N_{Rk,s,fi}$	[kN]	1.7	1.2	0.8	0.6	3.4	2.5	1.7	1.2	5.9	4.4	3.0	2.2
Characteristic resistance for W-SA-St with metric stud	$N_{Rk,s,fi}$	[kN]	1.7	1.2	0.8	0.6	1.8	1.5	1.1	1.0	-	-	-	-
Pullout														
Characteristic resistance in concrete C20/25 to C50/60	$N_{Rk,p,fi}$	[kN]	1.3		1.0		2.3		1.8		3.0		2.4	
Concrete cone failure														
Characteristic resistance in concrete C20/25 to C50/60	$N_{Rk,c,fi}$	[kN]	1.8		1.5		2.8		2.2		3.9		3.2	
Spacing	$s_{cr,N}$	[mm]	4 x h_{ef}											
	s_{min}	[mm]	s_{min} according to Annex 3											
Edge distance	$c_{cr,N}$	[mm]	2 x h_{ef}											
	c_{min}	[mm]	$c_{min} = 2 \times h_{ef}$; if fire attack is from more than one side, the edge distance of the anchor has to be bigger than 300 mm.											

in absence of other national regulations the partial safety factor for resistance under fire exposure $\gamma_{M,fi} = 1.0$ is recommended

Table 9: Characteristic values to shear loads under fire exposure in cracked and non-cracked concrete C20/25 to C50/60

Anchor size			Ø 7.5				Ø 10				Ø 12			
Fire resistance duration	R	[min]	30	60	90	120	30	60	90	120	30	60	90	120
Steel failure without lever arm														
Characteristic resistance	$V_{Rk,s,fi}$	[kN]	1.7	1.2	0.8	0.6	3.4	2.5	1.7	1.2	5.9	4.4	3.0	2.2
Steel failure with lever arm														
Characteristic anchor resistance	$M^0_{Rk,s,fi}$	[Nm]	1.5	1.1	0.7	0.5	4.0	3.0	2.0	1.5	8.8	6.6	4.4	3.3
Concrete pryout failure														
In Equation (5.6) of ETAG 001, Annex C, 5.2.3.3 the k-factor 2.0 (1.0 for Ø 7.5) and the relevant values of $N^0_{Rk,c,fi}$ of Table 8 have to be considered														
Concrete edge failure														
The initial value $V^0_{Rk,c,fi}$ of the characteristic resistance in concrete C20/25 to C50/60 under fire exposure may be determined by:														
$V^0_{Rk,c,fi} = 0,25 \times V^0_{Rk,c}$ (R30, R60, R90)							$V^0_{Rk,c,fi} = 0,20 \times V^0_{Rk,c}$ (R120)							
with $V^0_{Rk,c}$ initial value of the characteristic resistance in cracked concrete C20/25 under normal temperature														

in absence of other national regulations the partial safety factor

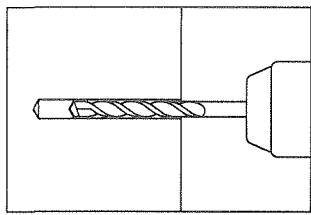
Würth Screw Anchor W-SA A4

for resistance under fire exposure $\gamma_{M,fi} = 1.0$ is recommended
Characteristic values of tension and shear load
resistance under fire exposure

Annex 6

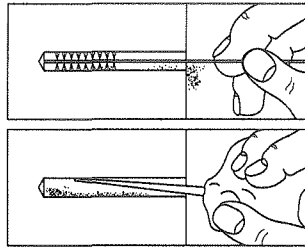
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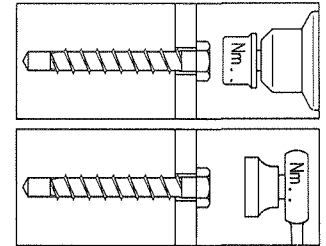
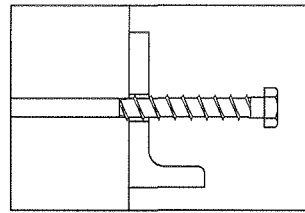


Drilling

Drill diameter d_0
and drilling depth h_1
have to be kept



Removal of drill dust
e.g. blowing



Installation

e.g. by hand or with
impact screwdriver

Verification: Head
supported to fixture and
embedment depth h_{nom}

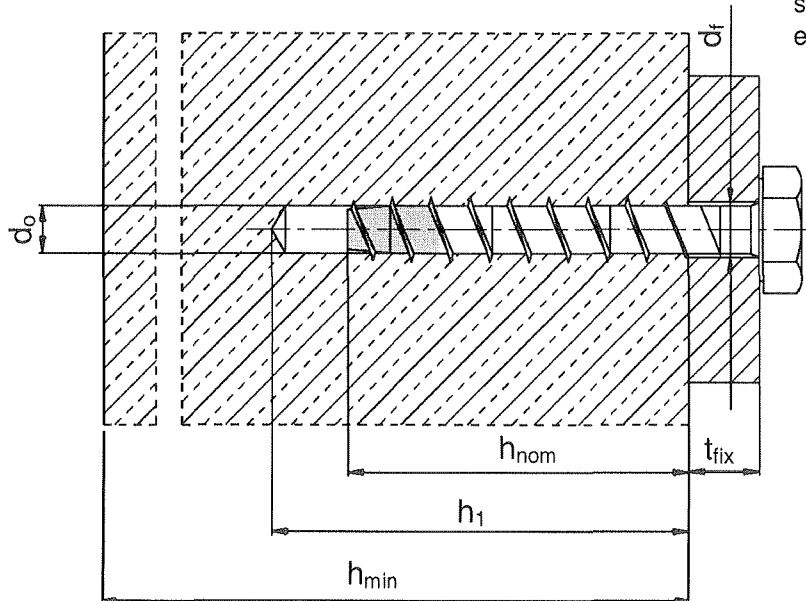


Table 10: Installation instructions

Anchor size		$\varnothing 7.5$	$\varnothing 10$	$\varnothing 12$
Nominal drill diameter	d_0 [mm]	6.0	8.0	10.0
Depth of drill hole	$h_1 \geq$ [mm]	75	90	100
Embedment depth	$h_{nom} \geq$ [mm]	65	75	90
Diameter of clearance hole in the fixture	$d_f \leq$ [mm]	9.0	12.0	14.0
Recommended installation tool		Impact screw driver, max. power output T_{max} according manufacturer information		
		100 Nm	250 Nm	250 Nm

Würth Screw Anchor W-SA A4

Installation instruction

Annex 7

of European
technical approval

ETA-06/0277