MR METAL

เมื่อต้องการต่อเติมโครงสร้าง หรือติดตั้งโครงสร้างใหม่ นึกถึงความปลอดภัย

เลือกใช้พุกเคมี MR-STAHL

คุณภาพสูงจากยุโรป

ETA CE

พุกเคมี

พุกเคมี คือ น้ำยาเคมีที่ทำหน้าที่ยึดกับสตัดพุกเคมีหรือเหล็กข้ออ้อย เข้ากับโครงสร้างคอนกรีต เช่น เสา, คาน เหมาะสำหรับงานที่ต้องรับแรงสูงๆ และต้องการความปลอดภัยสูงสุด เนื่องจากมีแรงยึดเกาะสูงมาก เช่น งานต่อเติมโครงสร้างอาคาร, งานติดตั้งเครื่องจักรที่มีแรงสั่นสะเทือน

ทำไมจึงต้องเลือกใช้พุกเคมี (MR- **STAHL**)

- ✓ มีผลรับรองตามมาตรฐานยุโรป (ETA)
- ✓ มีผลทดสอบแรงดึงจากสถาบัน AIT
- ✓ รับแรงดึงได้สูงมาก มีแรงยึดเหนี่ยวสูงมาก
- ✓ ใช้ในงานที่ต้องการความปลอดภัยสูงสุด
- ✓ ปลอดภัยต่อสุขภาพ ไม่มีสารก่อมะเร็ง (Styrene free) และไม่มีกลิ่น
- ✓ ใช้ได้ในงานที่ต้องรับแรงสั่นสะเทือนและแรงกระแทก
- ✓ ระยะห่างต่อจุดในการติดตั้งน้อย และติดตั้งใกล้ขอบของคอนกรีตได้ เนื่องจากไม่มีแรงเบ่งในคอนกรีต
- ✓ คงทนต่อการใช้งานในระยะยาว
- ✓ สามารถติดตั้งกับพื้นผิวคอนกรีตทั้งแห้งและเปียก หรือรูที่มีน้ำขัง
- ✓ สามารถใช้งานใต้น้ำได้

พุกเคมี-แบบปั่น SVA-VE	พุกเคมี-แบบตอก SHP-VE	น้ำยาเคมีเสียบเหล็ก สูตรแห้งเร็ว SVM-VSF-S	อีพ็อคซี่เสียบเหล็ก สูตรแห้งช้า SVM-EPX
• Vinylester Resin Spin-in Capsule	• Vinylester Resin Hammer-in Capsule	• Styrene-free Vinylester Resin Injection System	• Premium Pure Epoxy Rasin
	New 	New 	Coming Soon! 
✓ ใช้ต่อเติมโครงสร้างเหล็ก ✓ ส่วนผสมแน่นอน ✓ ติดตั้งโดยใช้ สว่าน ปั่น	✓ ใช้ต่อเติมโครงสร้างเหล็ก / คอนกรีต ✓ ประหยัดเวลาทำงาน ✓ ติดตั้งง่ายเพียงใช้ ค้อน ตอก	✓ ใช้ต่อเติมโครงสร้างเหล็ก / คอนกรีต ✓ ใช้งานง่าย ไม่ต้องผสมให้ยุ่งยาก ✓ ใช้กับปืนฉีดซิลิโคนทั่วไปได้ ✓ แห้ง เร็ว สามารถทำงานเสร็จได้เร็วขึ้น	✓ ใช้ต่อเติมโครงสร้างเหล็ก / คอนกรีต ✓ ใช้งานง่าย ไม่ต้องผสมให้ยุ่งยาก ✓ แห้งช้า – เหมาะสำหรับเหล็กข้ออ้อยขนาดใหญ่

Approvals and Reports
ETAG 001-05, Option 1

SVM-VSF-S

Styrene-free Vinylester Resin

น้ำยาเคมีเสียบเหล็ก–แบบใช้ปืนฉีด สูตรแห้งเร็ว

น้ำยาเคมีเสียบเหล็ก-แบบใช้ปืนฉีด สูตรแห้งเร็ว
SVM-VSF-S

Approvals and Reports
ETAG 001-05, Option 1

Styrene-free Vinylester Resin
น้ำยาเคมีเสียบเหล็ก-แบบใช้ปืนฉีด สูตรแห้งเร็ว

รายละเอียด

SVM-VSF-S 300 เป็นน้ำยาเคมีเสียบเหล็กที่สามารถรับแรงสูง สูตรแห้งเร็ว ขนาดบรรจุ 300 ml. แบบ 2 ส่วน ฉีดผสมกันด้วยปืนฉีดและหลอดผสม ผ่านมาตรฐานยุโรป ETA (European Technical Approved Option 1 for cracked concrete) ใช้งานง่าย สามารถใช้ได้กับปืนฉีดซิลิโคนทั่วไป, ปลอดภัย ไม่มีสารก่อมะเร็ง (Styrene free) เหมาะสำหรับใช้กับงานโครงสร้าง ใช้ได้กับสตัดพุกเคมีหรือเหล็กข้ออ้อยตั้งแต่ขนาดเล็กจนถึง DB32 mm. หรือจะใช้กับเหล็กเส้นกลมในงานสถาปัตย์ก็ได้

คุณสมบัติ

- ✓ รับแรงดึงได้สูง
- ✓ ใช้ได้ในงานที่ต้องการความปลอดภัยสูงสุด
- ✓ ประสิทธิภาพสูง เหมาะกับงานเสริมเหล็กข้ออ้อย
- ✓ ไม่มีแรงเบ่งในคอนกรีต ทำให้ระยะห่างต่อจุดและระยะขอบน้อย
- ✓ สามารถติดตั้งในคอนกรีตที่ชื้นและรูเจาะมีน้ำขัง
- ✓ ใช้ได้กับคอนกรีตที่แห้งหรือเปียกชื้น และหินธรรมชาติ
- ✓ ใช้งานสะดวก ใช้ได้กับปืนฉีดซิลิโคนทั่วไป
- ✓ ถ้าใช้ไม่หมด เก็บไว้ใช้งานครั้งต่อไปได้ โดยเปลี่ยนหลอดผสม (mixing nozzle)
- ✓ ไม่มีสารก่อมะเร็ง (Styrene free) และ ไม่มีกลิ่น
- ✓ Cracked and non-cracked concrete C20/25 - C50/60

ลักษณะการใช้งานทั่วไป

- งานยึดเหล็กข้ออ้อยเพื่อเสริมโครงสร้างคอนกรีตเสริมเหล็ก (Rebar Dowelling , Post-installed Rebar)
- งานต่อเติมหลังคากันสาด, พื้น Platform
- งานติดตั้งราวบันได, ราวกันตก
- งานติดตั้งลิฟท์
- งานติดตั้งแผงกันชน, รั้ว
- งานติดตั้งแบบหล่อคอนกรีต
- งานติดตั้ง ผนังอาคาร, โครงกระจก, แผ่นคอนกรีต
- งานติดตั้งเคเบิ้ลเทรย์, ติดตั้งท่อ

เหมาะสำหรับใช้กับวัสดุ

ผนังก่ออิฐ คอนกรีต หิน

ข้อดี ใช้ได้กับปืนฉีดซิลิโคนทั่วไป

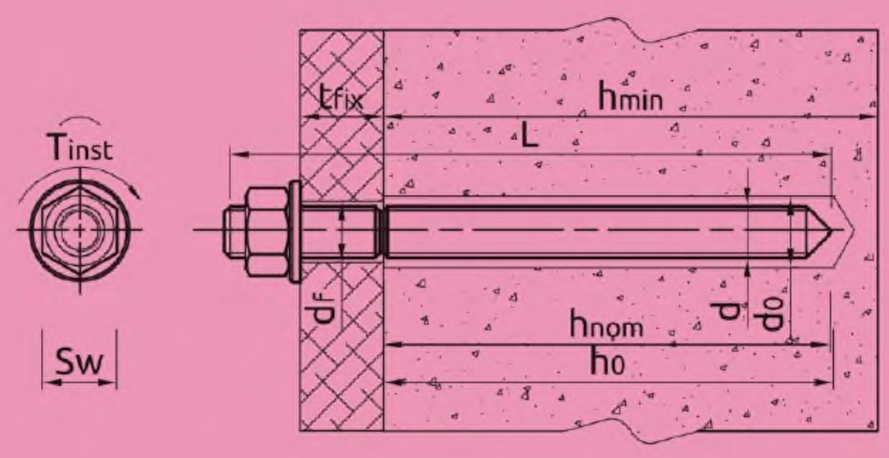
ใช้กับ สตัดพุกเคมี หรือ เหล็กข้ออ้อยได้

สตัดพุกเคมี

เหล็กข้ออ้อย

ข้อมูลการติดตั้ง SVM-VSF-S กับ สตัดพุกเคมี

SIZE (ขนาด)			M8	M10	M12	M16	M20	M24	M30
ขนาดสตัดพุกเคมี	d	(mm.)	8	10	12	16	20	24	30
ขนาด Ø รูเจาะคอนกรีต	d_0	(mm.)	10	12	14	18	24	28	35
ค่าทอร์ค / Torque	T_{inst}	(Nm.)	10	20	40	80	120	180	300
ขนาดประแจ	S_w	(mm.)	13	17	19	24	30	36	46
ความลึกของรูเจาะ	h_0	(mm.)	h_{ef} + 5						
ความลึกการติดตั้ง, ต่ำสุด	$h_{nom,\ min}$	(mm.)	60	70	80	100	120	140	165
ความลึกการติดตั้ง, ปกติ	$h_{nom,\ std}$	(mm.)	80	90	110	125	170	210	240
ความลึกการติดตั้ง, มากสุด	$h_{nom,\ max}$	(mm.)	100	120	145	190	240	290	360
ความหนาต่ำสุดของคอนกรีต	h_{min}	(mm.)	h_{ef} +30 ≥ 100				h_{ef} + 2* d_o		
ระยะห่างระหว่างพุกน้อยที่สุด	S_{min}	(Nm.)	0.5 *h_{ef} ≥ 40						
ระยะขอบน้อยที่สุด	C_{min}	(mm.)	0.5 *h_{ef} ≥ 40						



ค่าการรับแรงแนะนำที่ปลอดภัย (กรณีติดตั้งพุกตัวเดียว โดยไม่พิจารณาผลกระทบจากระยะขอบและระยะห่าง)

SUBSTRATE / ชนิดของคอนกรีต ขนาดสตัดพุกเคมี			Non-cracked concrete							Cracked concrete			
			M8	M10	M12	M16	M20	M24	M30	M12	M16	M20	M24
ค่าแรงดึงแนะนำที่ปลอดภัย N_{Rec}													
เกรด 5.8	ความลึกต่ำสุด	(kN)	7.8	11.3	14.3	20.0	26.3	28.5	36.4	7.8	9.0	12.0	14.4
	ความลึกปกติ	(kN)	8.6	13.8	20.0	27.4	40.3	48.5	53.8	10.7	11.2	17.0	21.5
	ความลึกมากสุด	(kN)	8.6	13.8	20.0	37.1	56.9	66.9	80.8	14.1	17.1	23.9	29.7
เกรด 8.8	ความลึกต่ำสุด	(kN)	7.8	11.3	14.3	20.0	26.3	28.5	36.4	7.8	9.0	12.0	14.4
	ความลึกปกติ	(kN)	10.4	14.6	21.4	27.4	40.3	48.5	53.8	10.7	11.2	17.0	21.5
	ความลึกมากสุด	(kN)	13.0	19.4	28.2	41.7	56.9	66.9	80.8	14.1	17.1	23.9	29.7
ค่าแรงเฉือนแนะนำที่ปลอดภัย V_{Rec}													
สตัดพุกเคมี เกรด 5.8		(kN)	5.1	8.0	12.0	22.3	34.9	50.3	80.0	12.0	22.3	34.9	50.3
สตัดพุกเคมี เกรด 8.8		(kN)	8.6	13.1	19.4	36.0	56.0	80.6	128.0	19.4	36.0	56.0	80.6

* หมายเหตุ 1 kN = 101.97 kg

น้ำยาเคมีเสียบเหล็ก-แบบใช้ปืนฉีด สูตรแห้งเร็ว
SVM-VSF-S

Approvals and Reports
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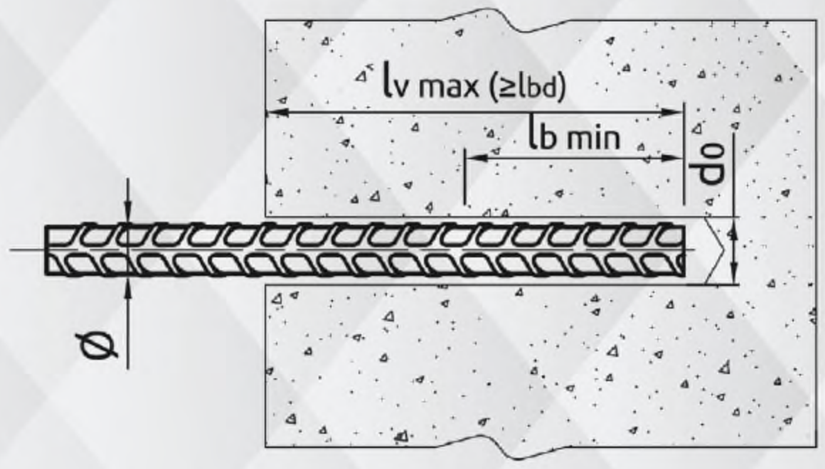
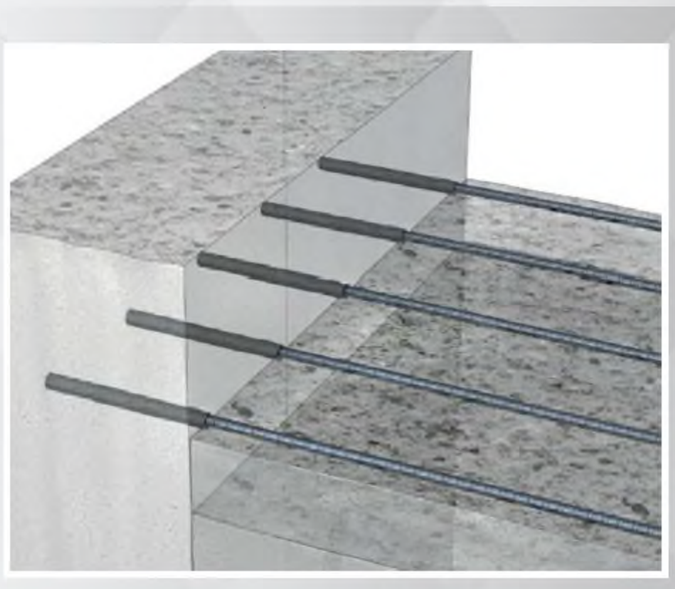
ข้อมูลการติดตั้ง SVM-VSF-S กับ เหล็กข้ออ้อย

ค่ารับแรงดึงที่ปลอดภัยของ SVM-VSF-S กับเหล็กข้ออ้อย เกรด SD40 (kN) ต่อ 1 จุด, กำลังอัดของคอนกรีต 200 ksc (ทรงกระบอก)

เหล็กข้ออ้อย เกรด SD40			DB10	DB12	DB16	DB20	DB25	DB28	DB2
ขนาดเหล็กข้ออ้อย	Ø	(mm.)	10	12	16	20	25	28	32
ขนาด Ø รูเจาะคอนกรีต	d_0	(mm.)	14	16	20	25	30	35	40
แรงดึงแนะนำที่จุดคลากของเหล็ก	f_y	(kN)	19.5	28.1	50.0	78.1	122.0	153.0	199.8
ความลึกสูงสุดที่เหล็กถึงแรงดึงแนะนำที่จุดคลาก	$l_{v,\,max}$	(mm.)	157	188	278	418	559	675	771

ความลึกรูเจาะคอนกรีต l_b, (mm.)	ค่าการรับแรงแนะนำที่ปลอดภัย N_{Rec} (kN)						
100	12.5						
120	15.0	18.0					
130	16.2	19.5					
140	17.5	20.9					
160	19.5	23.9	28.7				
180	19.5	26.9	32.3				
200	19.5	28.1	35.9	37.4			
220	19.5	28.1	39.5	41.1			
240	19.5	28.1	43.1	44.9			
250	19.5	28.1	44.9	46.8	54.5		
280	19.5	28.1	50.0	52.4	61.1	63.5	
290	19.5	188	50.0	54.2	63.3	65.8	
300	19.5	28.1	50.0	56.1	65.5	68.1	
320	19.5	28.1	50.0	59.8	69.8	72.6	
330	19.5	28.1	50.0	61.7	72.0	74.9	
380	19.5	28.1	50.0	71.1	82.9	86.2	98.5
400	19.5	28.1	50.0	74.8	87.3	90.8	103.7
450	19.5	28.1	50.0	78.1	98.2	102.1	116.7
500	19.5	28.1	50.0	78.1	109.1	113.4	129.7
550	19.5	28.1	50.0	78.1	120.0	124.8	142.6
600	19.5	28.1	50.0	78.1	122.0	136.1	155.6
700	19.5	28.1	50.0	78.1	122.0	153.0	181.5
800	19.5	28.1	50.0	78.1	122.0	153.0	199.8
900	19.5	28.1	50.0	78.1	122.0	153.0	199.8



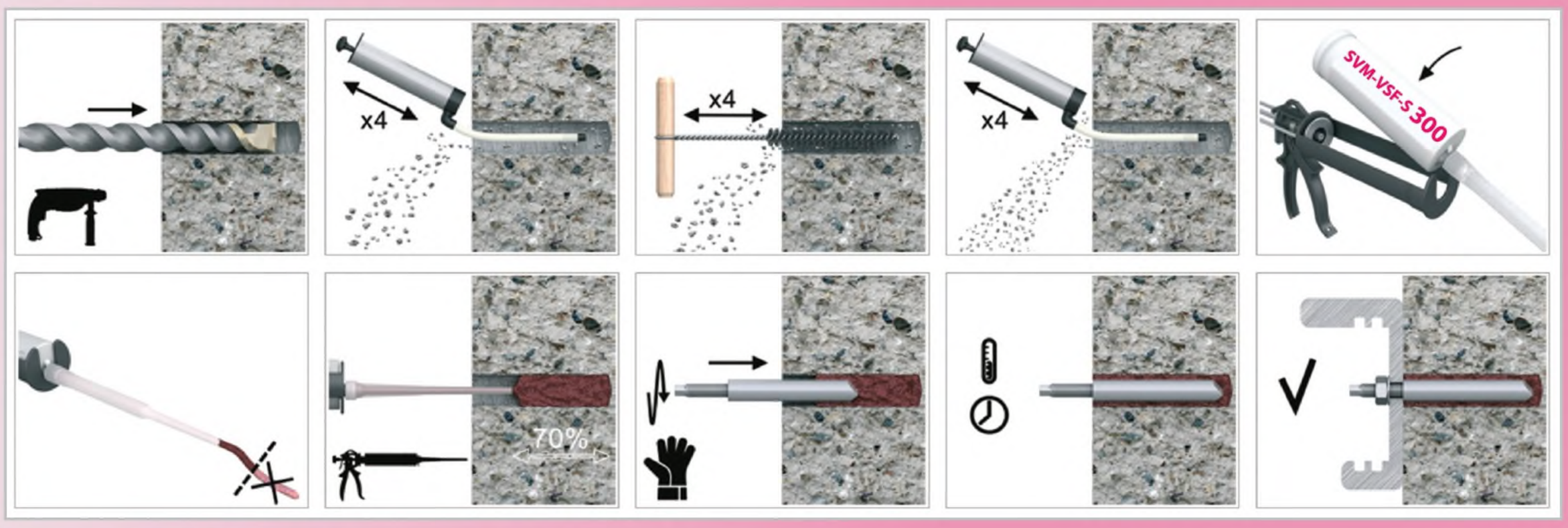


SVM-VSF-S

ระยะเวลาการบ่มตัว / MINIMUM CURING TIME

อุณหภูมิของพุกเคมี (°C)	อุณหภูมิของคอนกรีต (°C)	ระยะเวลาการทำงาน (นาที)	ระยะเวลาการบ่มตัว* (นาที)
5	0	50	1080
5	5	35	720
10	10	20	480
15	15	12	360
20	20	9	240
25	30	6	120
25	40	5	45
25	45	3	35

* ในกรณีที่คอนกรีตเปียก ระยะเวลาการบ่มตัวจะนานขึ้นเป็น 2 เท่า



ขั้นตอนการติดตั้ง

1. เจาะรูตามขนาดและความลึกที่กำหนด
2. ทำความสะอาดรูโดยใช้แปรงและเครื่องเป่าลม
3. ใส่กระบอกน้ำยาเคมีลงในปืนฉีด และต่อหัวฉีดน้ำยาเคมี
4. ฉีดน้ำยาเคมีช่วงแรกทิ้งเล็กน้อย จนสีของน้ำยาเคมีผสมกันดี
5. ฉีดน้ำยาเคมีจากก้นรูเจาะ พร้อมถอยหัวฉีดออกอย่างช้าๆ โดยฉีดน้ำยาประมาณ 70% ของความลึกรูเจาะ
6. ใช้เหล็กข้ออ้อยหรือสตัดพุกเคมีที่เตรียมไว้ ใส่เข้าไปในรูเจาะ โดยหมุนเข้าไปอย่างช้าๆ
7. รอให้น้ำยาเคมีเซ็ทตัว จนครบเวลาบ่มตัว

ข้อควรระวังในการติดตั้ง !

* ต้องทำความสะอาดรูเจาะโดยใช้แปรงและเครื่องเป่าลมเป่าเอาฝุ่นผงออกให้หมด
* ประสิทธิภาพของน้ำยาเคมีขึ้นอยู่กับการทำความสะอาดรูเป็นสำคัญ

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European Technical Assessment ETA-15/0568 of 25/08/2015

General Part

Technical Assessment Body issuing the European Technical Assessment	Instytut Techniki Budowlanej
Trade name of the construction product	STAHL POWER HIT SVM / STH RV 200, STAHL WINTER HIT SVM / STH RV 200-W and STAHL TROPICAL HIT SVM / STH RV 200-S
Product family to which the construction product belongs	Bonded anchor with anchor rod made of galvanized steel or stainless steel for use in cracked and non-cracked concrete
Manufacturer	STAHL GmbH Lutherstrasse 54 73614 Schorndorf Germany
Manufacturing plant	Manufacturing Plant no. 3
This European Technical Assessment contains	16 pages including 3 Annexes which form an integral part of this Assessment
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of	Guideline for European Technical Approval ETAG 001, Edition April 2013 "Metal anchors for use in concrete – Part 1: Anchors in general and Part 5: Bonded anchors", used as European Assessment Document (EAD)

This European Technical Assessment is issued by the Technical Assessment Body in its official language. Translations of this European Technical Assessment in other languages shall fully correspond to the original issued document and should be identified as such.

Specific Part

1 Technical description of the product

The STAHL POWER HIT SVM / STH RV 200, STAHL WINTER HIT SVM / STH RV 200-W and STAHL TROPICAL HIT SVM / STH RV 200-S are bonded anchors (injection type) consisting of a injection mortar cartridge using an applicator gun equipped with a special mixing nozzle and threaded anchor rod of the sizes M8 to M30 made of:

- galvanized carbon steel,
- stainless steel,
- high corrosion resistant stainless steel,

with hexagon nut and washer.

The threaded rod is placed into a drilled hole previously injected (using an applicator gun) with a mortar with a slow and slight twisting motion. The threaded rod is anchored by the bond between rod, mortar and concrete.

The threaded rods are available for all diameters with three type of tip end: a one side 45° chamfer, a two sides 45° chamfer or a flat. The threaded rods are either delivered with the mortar cartridges or commercial standard threaded rods purchased separately. The mortar cartridges are available in different sizes and types.

An illustration and the description of the products are given in Annex A1 to A3.

2 Specification of the intended use in accordance with the applicable European Assessment Document (EAD)

The performances given in Section 3 are only valid if the anchors are used in compliance with the specifications and conditions given in Annex B1 to B5.

The performances given in this European Technical Assessment 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 or the Technical Assessment Body, 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.

3 Performance of the product and references to the methods used for its assessment

3.1 Performance of the product

3.1.1 Mechanical resistance and stability (BWR 1)

The essential characteristic is detailed in the Annex C1 to C4.

3.1.2 Safety in case of fire (BWR 2)

No performance assessed.

3.1.3 Hygiene, health and the environment (BWR 3)

Regarding the dangerous substances clauses contained in this European Technical Assessment, there may be 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 Regulation, these requirements need also to be complied with, when and where they apply.

3.1.4 Safety in use (BWR 4)

For Basic Requirement Safety in use the same criteria are valid as for Basic Requirement Mechanical resistance and stability (BWR 1).

3.1.5 Sustainable use of natural resources (BWR 7)

No performance assessed.

3.2 Methods used for the assessment

The assessment of fitness of the anchors for the intended use in relation to the requirements for mechanical resistance and stability and safety in use in the sense of the Basic Requirements 1 and 4 has been made in accordance with the ETAG 001 *"Metal anchors for use in concrete"*, Part 1: "*Anchors in general*" and Part 5: "*Bonded anchors*", on the basis of Option 1 and 7.

4 Assessment and verification of constancy of performance (AVCP) system applied, with reference to its legal base

According to Decision 96/582/EC of the European Commission the system of assessment and verification of constancy of performance (see Annex V to Regulation (EU) No 305/2011) given in the following table applies.

Product	Intended use	Level or class	System
Metal anchors for use in concrete	For fixing and/or supporting to concrete structural elements (which contributes to the stability of the works) or heavy units	–	1

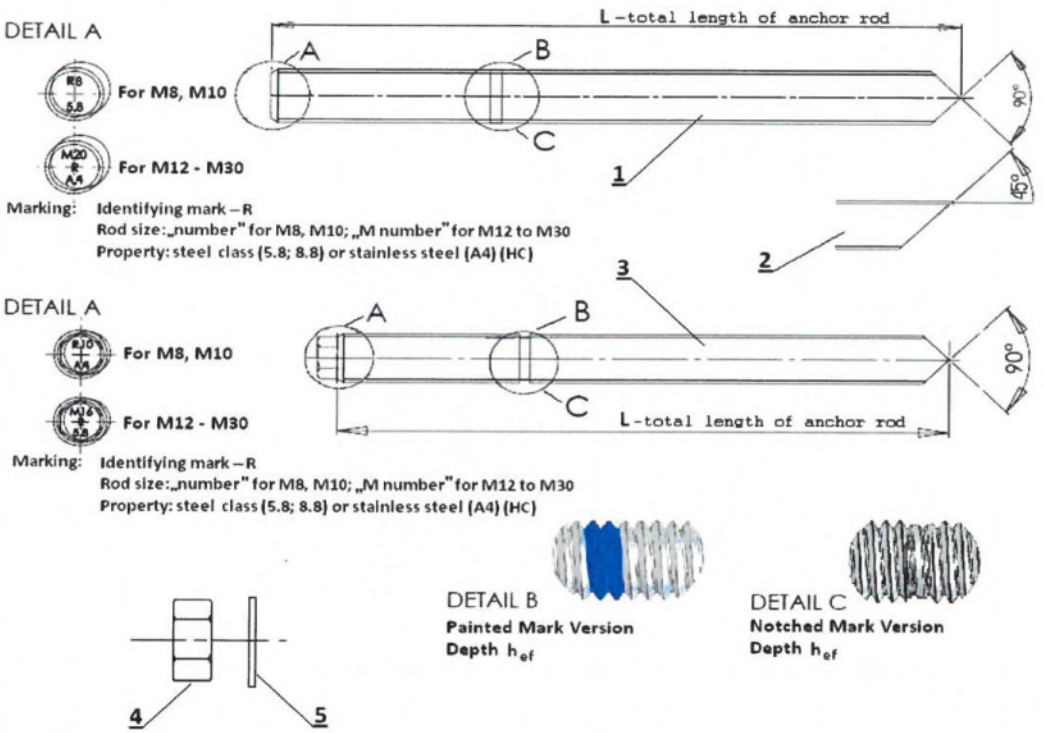
5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable European Assessment Document (EAD)

Technical details necessary for the implementation of the AVCP system are laid down in the control plan which is deposited at Instytut Techniki Budowlanej.

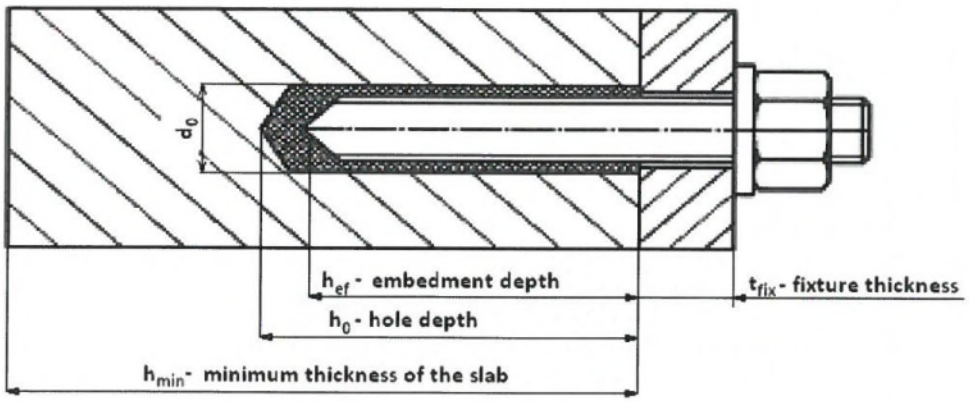
For type testing the results of the tests performed as part of the assessment for the European Technical Assessment shall be used unless there are changes in the production line or plant. In such cases the necessary type testing has to be agreed between Instytut Techniki Budowlanej and the notified body.

Issued in Warsaw on 25/08/2015 by Instytut Techniki Budowlanej

Marcin M. Kruk, PhD
Director of ITB



1. Anchor rod R-STUDS–(88),(A4),(HC)-FL
2. 45° shape with anchor rod
3. Anchor rod R-STUDS–(88),(A4),(HC) with the hexagonal tip
4. Hexagonal nut
5. Washer



STAHL POWER HIT SVM / STH RV 200, STAHL WINTER HIT SVM / STH RV 200-W and STAHL TROPICAL HIT SVM / STH RV 200-S	**Annex A1** of European Technical Assessment ETA-15/0568
Product description Characteristic of the product	

Table A1: Threaded rods

Part	Designation		
	Steel, zinc plated	**Stainless steel**	**High corrosion resistance stainless steel (HCR)**
Threaded rod	Steel, property class 5.8 to 12.9, acc. to EN ISO 898-1 electroplated ≥ 5 µm acc. to EN ISO 4042 or hot-dip galvanized ≥ 45 µm acc. to EN ISO 10684	Material 1.4401, 1.4404, 1.4571 acc. to EN 10088; property class 70 and 80 (A4-70 and A4-80) acc. to EN ISO 3506	Material 1.4529, 1.4565, 1.4547 acc. to EN 10088; property class 70 acc. to EN ISO 3506
Hexagon nut	Steel, property class 5 to 12, acc. to EN ISO 898-2; electroplated ≥ 5 µm acc. to EN ISO 4042 or hot-dip galvanized ≥ 45 µm acc. to EN ISO 10684	Material 1.4401, 1.4404, 1.4571 acc. to EN 10088; property class 70 and 80 (A4-70 and A4-80) acc. to EN ISO 3506	Material 1.4529, 1.4565, 1.4547 acc. to EN 10088; property class 70 acc. to EN ISO 3506
Washer	Steel, acc. to EN ISO 7089; electroplated ≥ 5 µm acc. to EN ISO 4042 or hot-dip galvanized ≥ 45 µm acc. to EN ISO 10684	Material 1.4401, 1.4404, 1.4571 acc. to EN 10088; corresponding to anchor rod material	Material 1.4529, 1.4565, 1.4547 acc. to EN 10088; corresponding to anchor rod material

Commercial standard threaded rods (in the case of rods made of galvanized steel – standard rods with property class ≤ 8.8 only), with:

- material and mechanical properties according to Table A1,
- confirmation of material and mechanical properties by inspection certificate 3.1 according to EN-10204:2004; the documents shall be stored,
- marking of the threaded rod with the embedment depth.

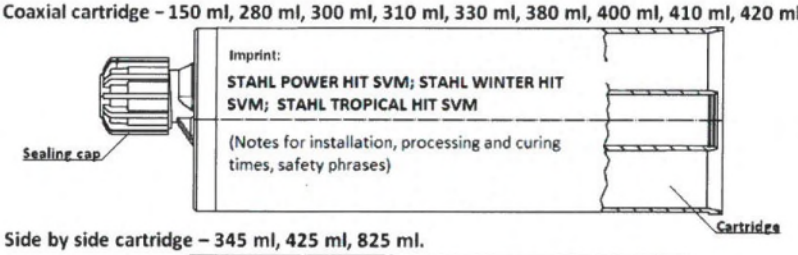
Note: Commercial standard threaded rods made of galvanized steel with property class above 8.8 are not permitted in some Member States.

Table A2: Injection mortars

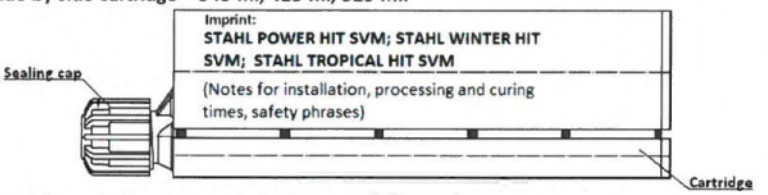
Product	Composition
STAHL POWER HIT SVM / STH RV 200 STAHL WINTER HIT SVM / STH RV 200-W STAHL TROPICAL HIT SVM / STH RV 200-S	Bonding agent: vinylester styrene free resin Hardener: dibenzoyl peroxide Additive: quartz sand (filler)

STAHL POWER HIT SVM / STH RV 200, STAHL WINTER HIT SVM / STH RV 200-W and STAHL TROPICAL HIT SVM / STH RV 200-S	**Annex A2** of European Technical Assessment ETA-15/0568
Product description Materials	

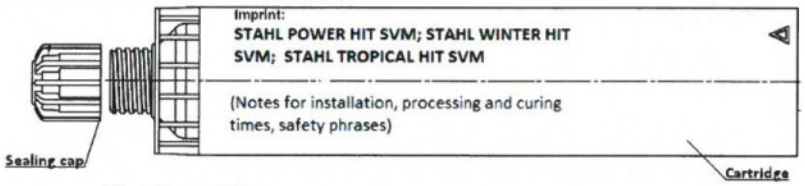
Coaxial cartridge – 150 ml, 280 ml, 300 ml, 310 ml, 330 ml, 380 ml, 400 ml, 410 ml, 420 ml.



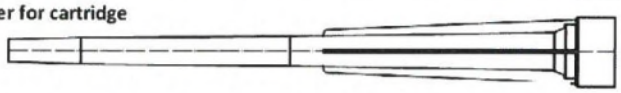
Side by side cartridge – 345 ml, 425 ml, 825 ml.



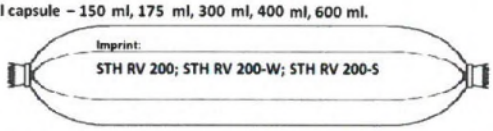
Cartridge a single component for two part foil capsules – 150 ml, 175 ml, 280 ml, 300 ml, 310 ml, 380 ml, 400 ml, 550 ml, 600 ml.



Mixer for cartridge

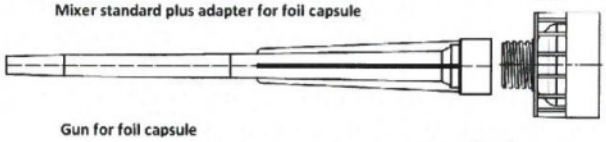


Foil capsule – 150 ml, 175 ml, 300 ml, 400 ml, 600 ml.

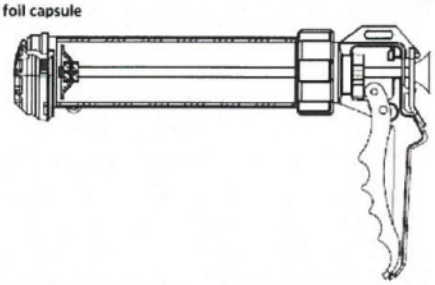


Mixer for foil capsule

Mixer standard plus adapter for foil capsule



Gun for foil capsule



STAHL POWER HIT SVM / STH RV 200, STAHL WINTER HIT SVM / STH RV 200-W and STAHL TROPICAL HIT SVM / STH RV 200-S	**Annex A3** of European Technical Assessment ETA-15/0568
Product description Cartridge types and sizes	

SPECIFICATION OF INTENDED USE

Use:

The anchors are intended to be used for anchorages for which requirements for mechanical resistance and stability and safety in use in the sense of the Basic Requirements 1 and 4 of Regulation (EU) 305/2011 shall be fulfilled and failure of anchorages made with these products would compromise the stability of the works, cause risk to human life and/or lead to considerable economic consequences.

Anchors subject to:

Static and quasi-static loads: sizes from M8 to M30.

Base material:

- Reinforced or unreinforced normal weight concrete of strength class C20/25 at minimum to C50/60 at maximum according to EN 206.
- Non cracked concrete: sizes from M8 to M30.
- Cracked concrete: sizes from M12 to M24.

Temperature range:

The anchors may be used in the following temperature range:

- -40°C to +40°C (max. short term temperature +40°C and max. long term temperature +24°C).
- -40°C to +80°C (max. short term temperature +80°C and max. long term temperature +50°C).

Use conditions (environmental conditions):

- Elements made of galvanized steel may be used in structures subject to dry internal conditions.
- Elements made of stainless steel may be used in structures subject to dry internal conditions and also in concrete 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).
- Elements made of high corrosion resistant stainless steel may be used in structures subject to dry internal conditions and also in concrete subject to external atmospheric exposure or exposure in permanently damp internal conditions or in other particular aggressive conditions. 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 chemical pollution (e.g. in desulphurization plants or road tunnels where de-icing materials are used).

Installation:

- Dry or wet concrete (use category 1): sizes from M8 to M30.
- Flooded holes with the exception of seawater (use category 2): sizes from M8 to M30.
- The anchors are suitable for rotary hammer drilled holes: sizes from M8 to M30.

Design methods:

EOTA Technical Report TR029 (September 2010) or CEN/TS 1992-4.

STAHL POWER HIT SVM / STH RV 200, STAHL WINTER HIT SVM / STH RV 200-W and STAHL TROPICAL HIT SVM / STH RV 200-S	**Annex B1** of European Technical Assessment ETA-15/0568
Intended use Intended use	

Table B1: Installation data

Size		**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M30**
Diameter of anchor rod	d [mm]	8	10	12	16	20	24	30
Nominal drilling diameter	d_0 [mm]	10	12	14	18	24	28	35
Maximum diameter hole in the fixture	d_{fix} [mm]	9	12	14	18	22	26	32
Effective embedment depth	$h_{ef,min}$ [mm]	60	70	80	100	120	140	165
	$h_{ef,max}$ [mm]	100	120	145	190	240	290	360
Depth of the drilling hole	h_0 [mm]	h_{ef} + 5 mm						
Minimum thickness of the concrete memeber	h_{min} [mm]	h_{ef} + 30 mm; ≥ 100 mm				$h_{ef} + 2 \cdot d_0$		
Torque moment	T_{inst} [N·m]	10	20	40	80	120	180	300
Minimum spacing	s_{min} [mm]	$0{,}5 \cdot h_{ef} \geq 40$ mm						
Minimum edge distance	c_{min} [mm]	$0{,}5 \cdot h_{ef} \geq 40$ mm						

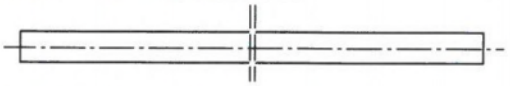
STAHL POWER HIT SVM / STH RV 200, STAHL WINTER HIT SVM / STH RV 200-W and STAHL TROPICAL HIT SVM / STH RV 200-S	**Annex B2** of European Technical Assessment ETA-15/0568
Intended use Installation data	

Table B2: Processing time and minimum curing time

Mortar temperature	Concrete temperature	Processing (open) time			Minimum curing time[1)]		
		STAHL POWER HIT SVM / ..	STAHL WINTER HIT SVM / ..	STAHL TROPICAL HIT SVM / ..	STAHL POWER HIT SVM / ..	STAHL WINTER HIT SVM / ..	STAHL TROPICAL HIT SVM / ..
5°C	-20°C	-	100 min.	-	-	24 h	-
5°C	-15°C	-	60 min.	-	-	16 h	-
5°C	-10°C	-	30 min.	-	-	8 h	-
5°C	-5°C	60 min.	16 min.	65 min.	6 h	4 h	24 h
5°C	0°C	40 min.	12 min.	-	3 h	2 h	-
5°C	5°C	20 min.	8 min.	35 min.	2 h	1 h	12 h
10°C	10°C	12 min.	5 min.	20 min.	80 min.	45 min.	8 h
15°C	15°C	8 min.	3 min.	12 min.	60 min.	30 min.	6 h
20°C	20°C	5 min.	2 min.	9 min.	45 min.	10 min.	4 h
25°C	25°C	-	-	7 min.	-	-	3 h
25°C	30°C	2 min.	-	6 min.	20 min.	-	2 h
25°C	40°C	0,5 min.	-	5 min.	10 min.	-	45 min.
25°C	45°C	-	-	3 min.	-	-	35 min.
25°C	50°C	-	-	3 min.	-	-	25 min.

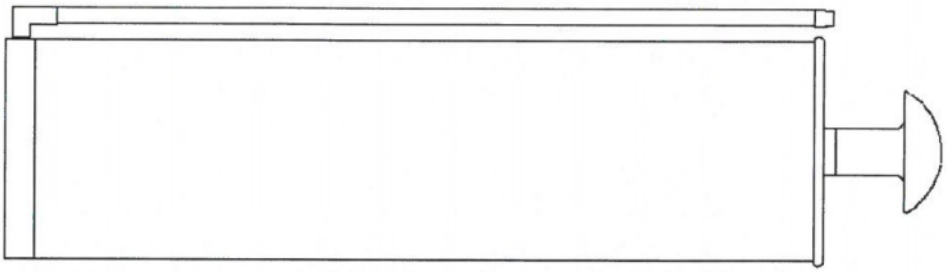
[1)] Curing time shall be doubled for the wet concrete. Minimum mortar temperature for installation +5°C; maximum mortar temperature for installation +25°C.

Additional mixer extension



*Variable length from 300mm up to 1000mm.

Manual blower pump

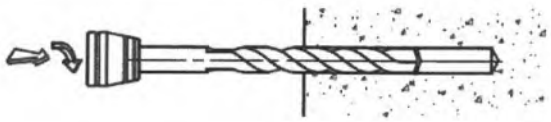
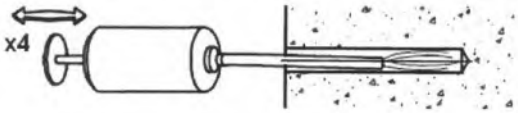
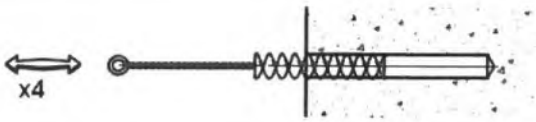
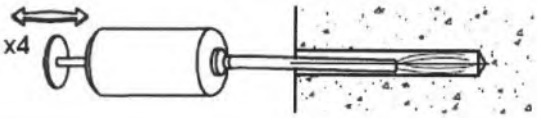
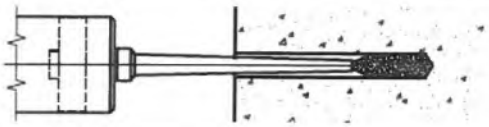
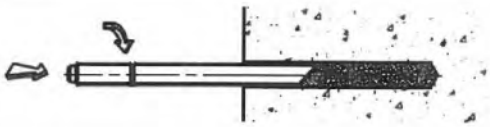


Steel brush

Brush diameter

Size rod	M8	M10	M12	M16	M20	M24	M30
Brushes diameter d_b (mm)	12	14	16	20	26	30	37

STAHL POWER HIT SVM / STH RV 200, STAHL WINTER HIT SVM / STH RV 200-W and STAHL TROPICAL HIT SVM / STH RV 200-S	**Annex B4** of European Technical Assessment ETA-15/0568
Intended use Cleaning tools	

	Drill a hole to the required diameter and depth using a rotary hammer drilling machine.
	Starting from the drill hole bottom blow the hole at least 4 times using the hand pump.
	Using the specified brush, mechanically brush out the hole at least 4 times.
	Starting from the drill hole bottom, blow at least 4 times with the hand pump.
	Insert the mixing nozzle to the far end of the hole and inject the mortar, slowly withdrawing the nozzle as the hole is filled to 2/3 of its' depth.
	Immediately insert the rod, slowly and with a slight twisting motion. Remove excess of mortar around the hole before it sets.
	Leave the fixing undisturbed until the cure time elapses.
	Attach the fixture and tighten the nut to the required torque.

STAHL POWER HIT SVM / STH RV 200, STAHL WINTER HIT SVM / STH RV 200-W and STAHL TROPICAL HIT SVM / STH RV 200-S	**Annex B5** of European Technical Assessment ETA-15/0568
Intended use Installation instruction	

Table C1: Characteristic values for tension loads

Size			M8	M10	M12	M16	M20	M24	M30
Steel failure									
Steel failure with threaded rod grade 5.8									
Characteristic resistance	$N_{Rk,s}$	[kN]	18	29	42	78	122	176	280
Partial safety factor	γ_{Ms} [1)]	[-]	1,50						
Steel failure with threaded rod grade 8.8									
Characteristic resistance	$N_{Rk,s}$	[kN]	29	46	67	126	196	282	449
Partial safety factor	γ_{Ms} [1)]	[-]	1,50						
Steel failure with threaded rod grade 10.9									
Characteristic resistance	$N_{Rk,s}$	[kN]	37	58	84	157	245	353	561
Partial safety factor	γ_{Ms} [1)]	[-]	1,40						
Steel failure with threaded rod grade 12.9									
Characteristic resistance	$N_{Rk,s}$	[kN]	44	70	101	188	294	424	673
Partial safety factor	γ_{Ms} [1)]	[-]	1,40						
Steel failure with stainless steel threaded rod A4-70									
Characteristic resistance	$N_{Rk,s}$	[kN]	26	41	59	110	171	247	393
Partial safety factor	γ_{Ms} [1)]	[-]	1,87						
Steel failure with stainless steel threaded rod A4-80									
Characteristic resistance	$N_{Rk,s}$	[kN]	29	46	67	126	196	282	449
Partial safety factor	γ_{Ms} [1)]	[-]	1,60						
Steel failure with high corrosion threaded rod grade 70									
Characteristic resistance	$N_{Rk,s}$	[kN]	26	41	59	110	171	247	393
Partial safety factor	γ_{Ms} [1)]	[-]	1,87						
Combined pull-out and concrete cone failure									
Characteristic bond resistance in non-cracked concrete C20/25									
Temperature range I: 40°C/24°C	$\tau_{Rk,ucr}$	[N/mm²]	13	13	13	11	9,5	9	7
Temperature range II: 80°C/50°C	$\tau_{Rk,ucr}$	[N/mm²]	10	11	10	9	7,5	7	5,5
Increasing factor for $\tau_{Rk,ucr}$ in non-cracked concrete	ψ_c	C30/37	1,04				1,0		
		C40/50	1,07				1,0		
		C50/60	1,09				1,0		
Partial safety factors for use category 1 + 2	$\gamma_{Mc}=\gamma_{Mp}=\gamma_{Msp}$ [1)]	[-]	1,8	1,8	1,8	1,8	1,8	2,1	2,1
Characteristic bond resistance in cracked concrete C20/25									
Temperature range I: 40°C/24°C	$\tau_{Rk,cr}$	[N/mm²]	-	-	6,5	4,5	4	4	-
Temperature range II: 80°C/50°C	$\tau_{Rk,cr}$	[N/mm²]	-	-	5,5	4	3	3	-
Increasing factor for $\tau_{Rk,cr}$ in cracked concrete	ψ_c	C30/37	-		1,04				-
		C40/50	-		1,07				-
		C50/60	-		1,09				-
Partial safety factors for use category 1 + 2	$\gamma_{Mc}=\gamma_{Mp}=\gamma_{Msp}$ [1)]	[-]	-	-	1,8	1,8	1,8	2,1	-

[1)] in the absence of national regulations

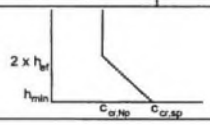
Note: design method according to TR 029

STAHL POWER HIT SVM / STH RV 200,
STAHL WINTER HIT SVM / STH RV 200-W
and STAHL TROPICAL HIT SVM / STH RV 200-S

Performances
Characteristic resistance under tension loads
in cracked and non-cracked concrete

Annex C1
of European
Technical Assessment
ETA-15/0568

Table C2: Characteristic values for tension loads

Size			M8	M10	M12	M16	M20	M24	M30
Splitting failure									
Effective anchorage depth h_{ef}	min	[mm]	60	70	80	100	120	140	165
	max	[mm]	100	120	145	190	240	290	360
Edge distance	$c_{cr,sp}$ for h_{min}	[mm]	$2,5 \cdot h_{ef}$		$2,0 \cdot h_{ef}$		$1,5 \cdot h_{ef}$		
	$c_{cr,sp}$ for $h_{min} < h^{2)} < 2 \cdot h_{ef}$ ($c_{cr,sp}$ from linear interpolation)	[mm]							
	$c_{cr,sp}$ for $h \geq 2 \cdot h_{ef}$	[mm]	$c_{cr,Np}$						
Spacing	$s_{cr,sp}$	[mm]	$2,0 \cdot c_{cr,sp}$						

1) in the absence of national regulations

2) h – concrete member thickness

Note: design method according to TR 029

Table C3: Shear loads for steel failure without lever arm

Size			M8	M10	M12	M16	M20	M24	M30
Steel failure with threaded rod grade 5.8									
Characteristic resistance	$V_{Rk,s}$	[kN]	9	14	21	39	61	88	140
Partial safety factor	γ_{Ms}	[-]	1,25						
Steel failure with threaded rod grade 8.8									
Characteristic resistance	$V_{Rk,s}$	[kN]	15	23	34	63	98	141	224
Partial safety factor	γ_{Ms}	[-]	1,25						
Steel failure with threaded rod grade 10.9									
Characteristic resistance	$V_{Rk,s}$	[kN]	18	29	42	78	122	176	280
Partial safety factor	γ_{Ms}	[-]	1,50						
Steel failure with threaded rod grade 12.9									
Characteristic resistance	$V_{Rk,s}$	[kN]	22	35	51	94	147	212	337
Partial safety factor	γ_{Ms}	[-]	1,50						
Steel failure with stainless steel threaded rod A4-70									
Characteristic resistance	$V_{Rk,s}$	[kN]	13	20	29	55	86	124	196
Partial safety factor	γ_{Ms}	[-]	1,56						
Steel failure with stainless steel threaded rod A4-80									
Characteristic resistance	$V_{Rk,s}$	[kN]	15	23	34	63	98	141	224
Partial safety factor	γ_{Ms}	[-]	1,33						
Steel failure with high corrosion stainless steel threaded rod grade 70									
Characteristic resistance	$V_{Rk,s}$	[kN]	13	20	29	55	86	124	196
Partial safety factor	γ_{Ms}	[-]	1,56						

STAHL POWER HIT SVM / STH RV 200,
STAHL WINTER HIT SVM / STH RV 200-W
and STAHL TROPICAL HIT SVM / STH RV 200-S

Annex C2
of European Technical Assessment ETA-15/0568

Performances
Characteristic resistance under tension and shear loads in cracked and non-cracked concrete

Table C4: Shear loads for steel failure with lever arm

Size			M8	M10	M12	M16	M20	M24	M30
Steel failure with threaded rod grade 5.8									
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	19	37	65	166	324	561	1124
Partial safety factor	γ_{Ms}	[-]	1,25						
Steel failure with threaded rod grade 8.8									
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	30	60	105	266	519	898	1799
Partial safety factor	γ_{Ms}	[-]	1,25						
Steel failure with threaded rod grade 10.9									
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	37	75	131	333	649	1123	2249
Partial safety factor	γ_{Ms}	[-]	1,50						
Steel failure with threaded rod grade 12.9									
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	45	90	157	400	779	1347	2699
Partial safety factor	γ_{Ms}	[-]	1,50						
Steel failure with stainless steel threaded rod A4-70									
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	26	52	92	233	454	786	1574
Partial safety factor	γ_{Ms}	[-]	1,56						
Steel failure with stainless steel threaded rod A4-80									
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	30	60	105	266	519	898	1799
Partial safety factor	γ_{Ms}	[-]	1,33						
Steel failure with high corrosion stainless steel threaded rod grade 70									
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	26	52	92	233	454	786	1574
Partial safety factor	γ_{Ms}	[-]	1,56						

Table C5: Characteristic values for shear loads – pry out and concrete edge failure

Size			M8	M10	M12	M16	M20	M24	M30
Effective anchorage depth h_{ef}	min	[mm]	60	70	80	100	120	140	165
	max	[mm]	100	120	145	190	240	290	360
Pry out failure									
Factor	k	[-]	2	2	2	2	2	2	2
Partial safety factor [1]	γ_{Mp}	[-]	1,5						
Concrete edge failure: see clause 5.2.3.4 of Technical Report TR 029									
Partial safety factor [1]	γ_{Mc}	[-]	1,5						

[1] in the absence of national regulation

Table C6: Displacement under tension loads – non-cracked concrete

Size			M8	M10	M12	M16	M20	M24	M30
Characteristic displacement in non-cracked concrete C20/25 to C50/60 under tension loads									
Admissible service load [1]	F	[kN]	8,5	12,8	16,6	23,9	30,5	35,4	40,0
Displacement	δ_{N0}	[mm]	0,25	0,35	0,40	0,40	0,45	0,50	0,50
	$\delta_{N\infty}$	[mm]	0,60	0,60	0,60	0,60	0,60	0,60	0,60

$F = F_{Rk} / \gamma_F \cdot \gamma_{Mc}$, with $\gamma_F = 1,4$

These values are suitable for each temperature range and categories specified in Annex B1

Table C7: Displacement under tension loads – cracked concrete

Size			M12	M16	M20	M24
Characteristic displacement in cracked concrete C20/25 to C50/60 under tension loads						
Admissible service load [1]	F	[kN]	7,9	9,9	11,9	15,9
Displacement	δ_{N0}	[mm]	0,10	0,30	0,30	0,32
	$\delta_{N\infty}$	[mm]	2,6	2,9	3,0	3,1

[1] $F = F_{Rk} / \gamma_F \cdot \gamma_{Mc}$, with $\gamma_F = 1,4$

These values are suitable for each temperature range and categories specified in Annex B1

Table C8: Displacement under shear loads

Size			M8	M10	M12	M16	M20	M24	M30
Characteristic displacement under shear loads									
Admissible service load [1]	F	[kN]	3,7	5,8	8,4	15,7	24,5	35,3	55,6
Displacement	δ_{V0}	[mm]	2,5	2,5	2,5	2,5	2,5	2,5	2,5
	$\delta_{V\infty}$	[mm]	3,7	3,7	3,7	3,7	3,7	3,7	3,7

[1] $F = F_{Rk} / \gamma_F \cdot \gamma_{Mc}$, with $\gamma_F = 1,4$

These values are suitable for each temperature range and categories specified in Annex B1

**STAHL POWER HIT SVM / STH RV 200,
STAHL WINTER HIT SVM / STH RV 200-W
and STAHL TROPICAL HIT SVM / STH RV 200-S**

Annex C4

of European Technical Assessment ETA-15/0568

Performances

Characteristic resistance under shear loads.
Displacement under service loads: tension and shear loads

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STRUCTURAL ENGINEERING LABORATORY
STRUCTURAL ENGINEERING FIELD OF STUDY
SCHOOL OF ENGINEERING AND TECHNOLOGY

TYPE OF TEST: **PULL-OUT TEST IN AXIAL TENSION**

TEST SPECIMEN: Three (3) specimens of " MR ANCHOR STUD 5.8-M8 x 110 mm. ZINC PLATED " bonded with " STAHL SVM-VSF " in concrete blocks having a size of 210 x 210 x 210 mm. were tested.

CLIENT: **MR METAL CO., LTD.**

DATE OF TEST: July 13, 2017

TEST RESULTS:

Specimen No.	Type of Specimen	Diameter of Drill hole (mm.)	Depth of Drill hole (mm.)	Span Length (mm.)	Maximum Load (kg.)	Mode of Failure
C1	M8x110 mm.	10.0	88.0	100	1,850	-The anchor stud slipped from the concrete block when applied the maximum load.
C2	M8x110 mm.	10.5	83.0	100	1,610	-The anchor stud slipped from the concrete block when applied the maximum load.
C3	M8x110 mm.	10.0	82.2	100	1,980	-The anchor stud failure occurred when applied the maximum load.

Note : This report certifies the adequacy and representative character of the test sample(s) only.

TESTED BY:

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TECHNICIAN

CHECKED & APPROVED BY:

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July 24, 2017

Doc. No. S0399C-17

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TYPE OF TEST: **PULL-OUT TEST IN AXIAL TENSION**

TEST SPECIMEN: Three (3) specimens of " MR ANCHOR STUD 5.8-M10 x 130 mm. ZINC PLATED " bonded with " STAHL SVM-VSF " in concrete blocks having a size of 300 x 300 x 300 mm. were tested.

CLIENT: **MR METAL CO., LTD.**

DATE OF TEST: July 13, 2017

TEST RESULTS:

Specimen No.	Type of Specimen	Diameter of Drill hole (mm.)	Depth of Drill hole (mm.)	Span Length (mm.)	Maximum Load (kg.)	Mode of Failure
C4	M10x130 mm.	12.0	94.0	200	3,050	-The failure occurred due to concrete breakout when applied the maximum load.
C5	M10x130 mm.	13.0	99.0	200	2,680	-The failure occurred due to concrete breakout when applied the maximum load.
C6	M10x130 mm.	13.0	94.3	200	3,380	-The anchor stud failure occurred when applied the maximum load.

Note : This report certifies the adequacy and representative character of the test sample(s) only.

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STRUCTURAL ENGINEERING LABORATORY
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TYPE OF TEST: **PULL-OUT TEST IN AXIAL TENSION**

TEST SPECIMEN: Two (2) specimens of " MR ANCHOR STUD 5.8-M16 x 190 mm. ZINC PLATED " bonded with " STAHL SVM-VSF " in concrete blocks having a size of 300 x 300 x 300 mm. were tested.

CLIENT: **MR METAL CO., LTD.**

DATE OF TEST: July 13, 2017

TEST RESULTS:

Specimen No.	Type of Specimen	Diameter of Drill hole (mm.)	Depth of Drill hole (mm.)	Span Length (mm.)	Maximum Load (kg.)	Mode of Failure
C10	M16x190 mm.	17.8	135.0	200	7,200	-The failure occurred due to concrete breakout when applied the maximum load.
C11	M16x190 mm.	17.6	130.0	200	6,140	-The failure occurred due to concrete breakout when applied the maximum load.

Note : This report certifies the adequacy and representative character of the test sample(s) only.

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TYPE OF TEST: **PULL-OUT TEST IN AXIAL TENSION**

TEST SPECIMEN: One (1) specimen of " MR ANCHOR STUD 5.8-M16 x 190 mm. ZINC PLATED " bonded with " STAHL SVM-VSF " in concrete blocks having a size of 450 x 450 x 450 mm. were tested.

CLIENT: **MR METAL CO., LTD.**

DATE OF TEST: July 13, 2017

TEST RESULTS:

Specimen No.	Type of Specimen	Diameter of Drill hole (mm.)	Depth of Drill hole (mm.)	Span Length (mm.)	Maximum Load (kg.)	Mode of Failure
C10	M16x190 mm.	17.8	135.0	300	6,870	-The anchor stud slipped from the concrete block when applied the maximum load.

Note : This report certifies the adequacy and representative character of the test sample(s) only.

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TYPE OF TEST: **PULL-OUT TEST IN AXIAL TENSION**

TEST SPECIMEN: Three (3) specimens of " MR ANCHOR STUD 5.8-M20 x 260 mm. ZINC PLATED " bonded with " STAHL SVM-VSF " in concrete blocks having a size of 450 x 450 x 450 mm. were tested.

CLIENT: **MR METAL CO., LTD.**

DATE OF TEST: July 13, 2017

TEST RESULTS:

Specimen No.	Type of Specimen	Diameter of Drill hole (mm.)	Depth of Drill hole (mm.)	Span Length (mm.)	Maximum Load (kg.)	Mode of Failure
C13	M20x260 mm.	24.8	180.0	300	11,750	-The anchor stud slipped from the concrete block when applied the maximum load.
C14	M20x260 mm.	24.1	175.0	300	11,860	-The anchor stud slipped from the concrete block when applied the maximum load.
C15	M20x260 mm.	24.1	180.0	300	11,160	-The anchor stud slipped from the concrete block when applied the maximum load.

Note : This report certifies the adequacy and representative character of the test sample(s) only.

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TYPE OF TEST: **PULL-OUT TEST IN AXIAL TENSION**

TEST SPECIMEN: Three (3) specimens of " MR ANCHOR STUD 5.8-M24 x 300 mm. ZINC PLATED " bonded with " STAHL SVM-VSF " in concrete blocks having a size of 450 x 450 x 450 mm. were tested.

CLIENT: **MR METAL CO., LTD.**

DATE OF TEST: July 13, 2017

TEST RESULTS:

Specimen No.	Type of Specimen	Diameter of Drill hole (mm.)	Depth of Drill hole (mm.)	Span Length (mm.)	Maximum Load (kg.)	Mode of Failure
C16	M24x300 mm.	27.2	215.0	300	15,890	-The anchor stud slipped from the concrete block when applied the maximum load.
C17	M24x300 mm.	28.8	210.0	300	15,840	-The anchor stud slipped from the concrete block when applied the maximum load.
C18	M24x300 mm.	28.7	210.0	300	15,120	-The anchor stud slipped from the concrete block when applied the maximum load.

Note : This report certifies the adequacy and representative character of the test sample(s) only.

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TYPE OF TEST: **PULL-OUT TEST IN AXIAL TENSION**

TEST SPECIMEN: Three (3) " TSC DB10 SD40 " deformed bar bonded with " STAHL SVM-VSF " in concrete blocks having a size of 200 x 200 x 200 mm. were tested.

CLIENT: **MR METAL CO., LTD.**

DATE OF TEST: July 20, 2017

TEST RESULTS:

Specimen No.	Type of Specimen	Diameter of Drill hole (mm.)	Depth of Drill hole (mm.)	Span Length (mm.)	Maximum Load (kg.)	Mode of Failure
D1	TSC DB10 SD40	14.4	101.9	100	3,800	-The deformed bar slipped from the concrete block when applied the maximum load.
D2	TSC DB10 SD40	14.3	105.3	100	4,300	-The deformed bar slipped from the concrete block when applied the maximum load.
D3	TSC DB10 SD40	14.1	108.0	100	4,300	-The deformed bar slipped from the concrete block when applied the maximum load.

Note : This report certifies the adequacy and representative character of the test sample(s) only.

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TYPE OF TEST: **PULL-OUT TEST IN AXIAL TENSION**

TEST SPECIMEN: Three (3) " TDC DB12 SD40 " deformed bar bonded with " STAHL SVM-VSF " in concrete blocks having a size of 300 x 300 x 300 mm. were tested.

CLIENT: **MR METAL CO., LTD.**

DATE OF TEST: July 20, 2017

TEST RESULTS:

Specimen No.	Type of Specimen	Diameter of Drill hole (mm.)	Depth of Drill hole (mm.)	Span Length (mm.)	Maximum Load (kg.)	Mode of Failure
D4	TDC DB12 SD40	15.4	120.5	200	6,400	-The deformed bar slipped from the concrete block when applied the maximum load.
D5	TDC DB12 SD40	17.0	127.9	200	7,150	-The deformed bar slipped from the concrete block when applied the maximum load.
D6	TDC DB12 SD40	16.1	125.4	200	7,020	-The deformed bar slipped from the concrete block when applied the maximum load.

Note : This report certifies the adequacy and representative character of the test sample(s) only.

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TYPE OF TEST: **PULL-OUT TEST IN AXIAL TENSION**

TEST SPECIMEN: Three (3) " SKY DB16 SD40 " deformed bar bonded with " STAHL SVM-VSF " in concrete blocks having a size of 300 x 300 x 300 mm. were tested.

CLIENT: **MR METAL CO., LTD.**

DATE OF TEST: July 20, 2017

TEST RESULTS:

Specimen No.	Type of Specimen	Diameter of Drill hole (mm.)	Depth of Drill hole (mm.)	Span Length (mm.)	Maximum Load (kg.)	Mode of Failure
D7	SKY DB16 SD40	19.9	160.2	200	9,140	-The deformed bar slipped from the concrete block when applied the maximum load.
D8	SKY DB16 SD40	20.2	162.7	200	8,620	-The failure occurred due to concrete breakout when applied the maximum load.
D9	SKY DB16 SD40	19.8	165.3	200	9,370	-The deformed bar slipped from the concrete block when applied the maximum load.

Note : This report certifies the adequacy and representative character of the test sample(s) only.

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TYPE OF TEST: **PULL-OUT TEST IN AXIAL TENSION**

TEST SPECIMEN: Three (3) " RSM DB20 SD40 " deformed bar bonded with " STAHL SVM-VSF " in concrete blocks having a size of 450 x 450 x 450 mm. were tested.

CLIENT: **MR METAL CO., LTD.**

DATE OF TEST: July 20, 2017

TEST RESULTS:

Specimen No.	Type of Specimen	Diameter of Drill hole (mm.)	Depth of Drill hole (mm.)	Span Length (mm.)	Maximum Load (kg.)	Mode of Failure
D10	RSM DB20 SD40	26.0	210.0	300	15,190	-The deformed bar slipped from the concrete block when applied the maximum load.
D11	RSM DB20 SD40	26.0	205.0	300	14,940	-The deformed bar slipped from the concrete block when applied the maximum load.
D12	RSM DB20 SD40	26.0	200.0	300	14,480	-The deformed bar slipped from the concrete block when applied the maximum load.

Note : This report certifies the adequacy and representative character of the test sample(s) only.

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TYPE OF TEST: **PULL-OUT TEST IN AXIAL TENSION**

TEST SPECIMEN: One (1) " SKY DB25 SD40 " deformed bar bonded with " STAHL SVM-VSF " in concrete blocks having a size of 450 x 450 x 450 mm. was tested.

CLIENT: **MR METAL CO., LTD.**

DATE OF TEST: July 20, 2017

TEST RESULTS:

Specimen No.	Type of Specimen	Diameter of Drill hole (mm.)	Depth of Drill hole (mm.)	Span Length (mm.)	Maximum Load (kg.)	Mode of Failure
D13	SKY DB25 SD40	30.0	260.0	300	19,750	-The deformed bar slipped from the concrete block when applied the maximum load.

Note : This report certifies the adequacy and representative character of the test sample(s) only.

TESTED BY:

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July 31, 2017

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COMPANY

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Innovative ideas and engaged employees are the base of success and perfect products.

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All resin and hardener mixtures are subject to a permanent control in chemical and mechanical laboratory to guarantee resin compositions and pull-out values of high quality as stated in the official approval certificates.

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