Deutsches Institut für Bautechnik
Zulassungsstelle für Bauprodukte und Bauarten
Bautechnisches Prüfamt
Eine vom Bund und den Ländern gemeinsam getragene Anstalt des öffentlichen Rechts

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

Deutsches Institut für Bautechnik
DIBt

Mitglied der EOTA
Member of EOTA

European Technical Approval ETA-13/0224

English translation prepared by DIBt - Original version in German language

Handelsbezeichnung *Trade name*		Modersohn Ankerschiene MBA *Modersohn Anchor Channel MBA*
Zulassungsinhaber *Holder of approval*		Wilhelm Modersohn GmbH & Co. KG Eggeweg 2 a 32139 Spenge DEUTSCHLAND
Zulassungsgegenstand und Verwendungszweck *Generic type and use of construction product*		Ankerschienen *Anchor channels*
Geltungsdauer: *Validity:*	vom *from* bis *to*	8 May 2013 8 May 2018
Herstellwerk *Manufacturing plant*		Werk Spenge Eggeweg 2a 32139 Spenge

Diese Zulassung umfasst *This Approval contains*	27 Seiten einschließlich 19 Anhänge *27 pages including 19 annexes*

I LEGAL BASES AND GENERAL CONDITIONS

1 This European technical approval is issued by Deutsches Institut für Bautechnik in accordance with:

- Council Directive 89/106/EEC of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products[1], modified by Council Directive 93/68/EEC[2] and Regulation (EC) N° 1882/2003 of the European Parliament and of the Council[3];
- *Gesetz über das In-Verkehr-Bringen von und den freien Warenverkehr mit Bauprodukten zur Umsetzung der Richtlinie 89/106/EWG des Rates vom 21. Dezember 1988 zur Angleichung der Rechts- und Verwaltungsvorschriften der Mitgliedstaaten über Bauprodukte und anderer Rechtsakte der Europäischen Gemeinschaften (Bauproduktengesetz - BauPG) vom 28. April 1998[4], as amended by Article 2 of the law of 8 November 2011[5];*
- Common Procedural Rules for Requesting, Preparing and the Granting of European technical approvals set out in the Annex to Commission Decision 94/23/EC[6].

2 Deutsches Institut für Bautechnik is authorized to check whether the provisions of this European technical approval are met. Checking may take place in the manufacturing plant. Nevertheless, the responsibility for the conformity of the products to the European technical approval and for their fitness for the intended use remains with the holder of the European technical approval.

3 This European technical approval is not to be transferred to manufacturers or agents of manufacturers other than those indicated on page 1, or manufacturing plants other than those indicated on page 1 of this European technical approval.

4 This European technical approval may be withdrawn by Deutsches Institut für Bautechnik, in particular pursuant to information by the Commission according to Article 5(1) of Council Directive 89/106/EEC.

5 Reproduction of this European technical approval including transmission by electronic means shall be in full. However, partial reproduction can be made with the written consent of Deutsches Institut für Bautechnik. In this case partial reproduction has to be designated as such. Texts and drawings of advertising brochures shall not contradict or misuse the European technical approval.

6 The European technical approval is issued by the approval body in its official language. This version corresponds fully to the version circulated within EOTA. Translations into other languages have to be designated as such.

1 Official Journal of the European Communities L 40, 11 February 1989, p. 12
2 Official Journal of the European Communities L 220, 30 August 1993, p. 1
3 Official Journal of the European Union L 284, 31 October 2003, p. 25
4 *Bundesgesetzblatt Teil I 1998*, p. 812
5 *Bundesgesetzblatt Teil I 2011*, p. 2178
6 Official Journal of the European Communities L 17, 20 January 1994, p. 34

II SPECIFIC CONDITIONS OF THE EUROPEAN TECHNICAL APPROVAL

1 Definition of product and intended use

1.1 Definition of the construction product

The Modersohn Anchor Channel MBA is an anchor channel consisting of a C-shaped channel cold-formed steel and at least two metal anchors non-detachably fixed on the profile back.

The anchor channel is imbedded surface-flush in the concrete. Modersohn special screws (hammerhead or hooked) with appropriate hexagon nuts and washers will be fixed in the channel.

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

1.2 Intended use

The anchor channel 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 channel is to be used only for anchorages subject to static or quasi-static loading in reinforced or unreinforced normal weight concrete of strength classes C12/15 at minimum to C90/105 at most according to EN 206-1:2000-12. The anchor channel may be anchored in cracked and non-cracked concrete.

The anchor channel may be used for transmission of tensile loads, shear loads, or a combination of tensile and shear loads perpendicular to the longitudinal axis of the channel.

The intended use of the anchor channel (channel profile, anchor, special screw, washer and nut) concerning corrosion is given in Annex 3, Table 1 depending on the chosen material.

The provisions made in this European technical approval are based on an assumed working life of the anchor channel 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 channel corresponds to the drawings and information given in Annex 2 to 6. The characteristic material values, dimensions and tolerances of the anchor channel not indicated in the Annexes shall correspond to respective values laid down in the technical documentation[7] of this European technical approval.

Regarding the requirements concerning safety in case of fire it is assumed that the anchor channel 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 Deutsches Institut für Bautechnik and, as far as it is relevant to the tasks of the approved body 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 Annexes 7 to 16.

The anchor channel shall be marked with the identifying mark of the producer, the type, the size and additionally with the type of stainless steel, e.g. MBA 38/17-D4 according to Annex 2. The position of the anchor is marked for anchor channels with weld-on anchors by nail holes in the channel profile.

Each special screw is marked with the identifying mark of the producer, the strength grade and the type of stainless steel according to Annex 2.

2.2 Method of verification

2.2.1 General

The assessment of the fitness of the anchor channel 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 the following verifications:

Verifications for tension loads for

1.	Distribution of acting tension loads	
2.	Steel failure - anchor	$N_{Rk,s,a}$
3.	Steel failure - special screw	$N_{Rk,s,s}$
4.	Steel failure - connection channel/ anchor	$N_{Rk,s,c}$
5.	Steel failure - local flexure of channel lips	$N_{Rk,s,l}$
6.	Steel failure - flexure resistance of channel	$M_{Rk,s,flex}$
7.	Steel failure - transfer of setting torque into prestressing force	T_{inst}
8.	Concrete failure - pullout	$N_{Rk,p}$
9.	Concrete failure - concrete cone	$N_{Rk,c}$
10.	Concrete failure - splitting due to installation	c_{min}, s_{min}, h_{min}
11.	Concrete failure - splitting due to loading	$N_{Rk,sp}$
12.	Concrete failure - blow-out	$N_{Rk,cb}$
13.	Reinforcement	$N_{Rk,re}$, $N_{Rd,a}$
14.	Displacement under tension loads	δ_N

Verifications for shear loads for

1.	Distribution of acting shear loads	
2.	Steel failure without lever arm - special screw	$V_{Rk,s,s}$
3.	Steel failure without lever arm - flexure channel lips	$V_{Rk,sl}$
4.	Steel failure with lever arm	$M^0_{Rk,s}$
5.	Concrete failure - pry-out	$V_{Rk,cp}$
6.	Concrete failure - concrete edge	$V_{Rk,c}$
7.	Reinforcement	$V_{Rk,c,re}$
8.	Displacement under shear loads	δ_V

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 2000/273/EC of the European Commission[8] system 2(i) (referred to as system 1) of the 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 prescribed test 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 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 with 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 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 anchor channels 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.

[8] Official Journal of the European Communities L 86 of 07.04.2000

[9] The control plan is a confidential part of the European technical approval and only handed over to the approved body involved in the procedure of attestation of conformity. See section 3.2.2.

3.2.2 Tasks of 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 channel. 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,
- trade name of the anchor channels and special screws.

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 channel for the intended use is given under the following condition:

The design of the anchorage is based on the CEN/TS 1992-4:2009 "Design of fastenings for use in concrete", part 1 and 3 under the responsibility of an engineer experienced in anchorages and concrete work.

The verification for shear load with supplementary reinforcement follows CEN/TS 1992-4-3:2009, section 6.3.6 and 6.3.7 or alternatively Annexes 15 and 16.

The reduction of the member cross section caused by the anchor channel is taken into account for the verification of the concrete member if necessary.

The member thickness is not less than h_{min} indicated in Annex 7, Table 8.

The edge distance of the anchors on the profile back of the channel is not less than c_{min} indicated in Annex 7, Table 8.

The spacing of the anchors is between the s_{min} and s_{max} given in Annex 5, Table 5.

The spacing of the special screws is not less than $s_{min,s}$ given in Annex 8, Table 9.

The effective anchorage depth is not less than min h_{ef} according to Annex 7, Table 8.

The characteristic resistances are calculated with the minimum effective anchorage depth.

Taking into account the loads to be anchored verifiable calculation notes and drawings are generated.

The position, the type, the size, the length, of the anchor channel, if applicable the spacing of the anchors, and if applicable the position as well as the size of the special screws are indicated on the design drawings. The material of the anchor channel and the special screw is given additionally on the drawings.

4.3 Installation of the anchor channel

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

- Installation by appropriately qualified personnel and under the supervision of the person responsible for technical matters on site.
- Use of the anchor channel only as supplied by the manufacturer without exchanging the components.
- Installation in accordance with the manufacturer's specifications given in Annexes 18 and 19 and the design drawings.
- The anchor channels are fixed on the formwork such that no movement of the channels will occur during the time of laying the reinforcement and of placing and compacting the concrete.
- The concrete under the head of the anchors are properly compacted. The channels are protected from penetration of concrete into the internal space of the channels.
- Size and spacing of special screws corresponding to the design drawings.
- Orientating the special screw (notch according Annex 6) rectangular to the channel axis.
- Observation of the prescribed values (e.g. T_{inst} according Annex 8) of installation.
- The setting torques given in Annex 8 must not be exceeded.

5 Responsibility of the manufacturer

It is in the responsibility of the manufacturer 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:

- dimensions of the anchor channel,
- mentioning of the matching screws,
- materials of the anchor channel (channel, anchor, screw , washer, nut)
- details on the installation procedure, preferably by using illustrations,
- maximum setting torque,
- identification of the manufacturing batch.

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

Uwe Bender
Head of Department

beglaubigt:
Müller

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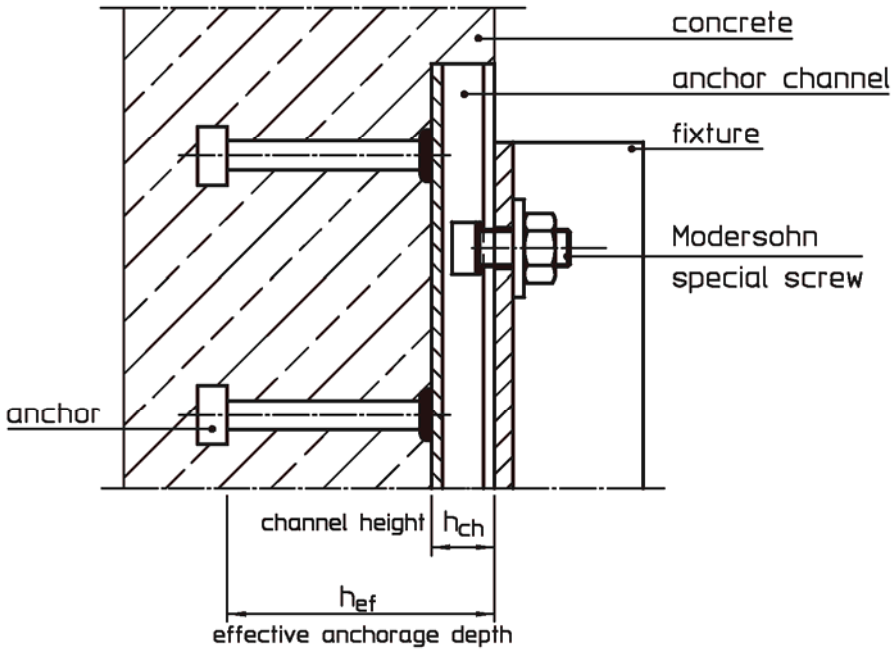

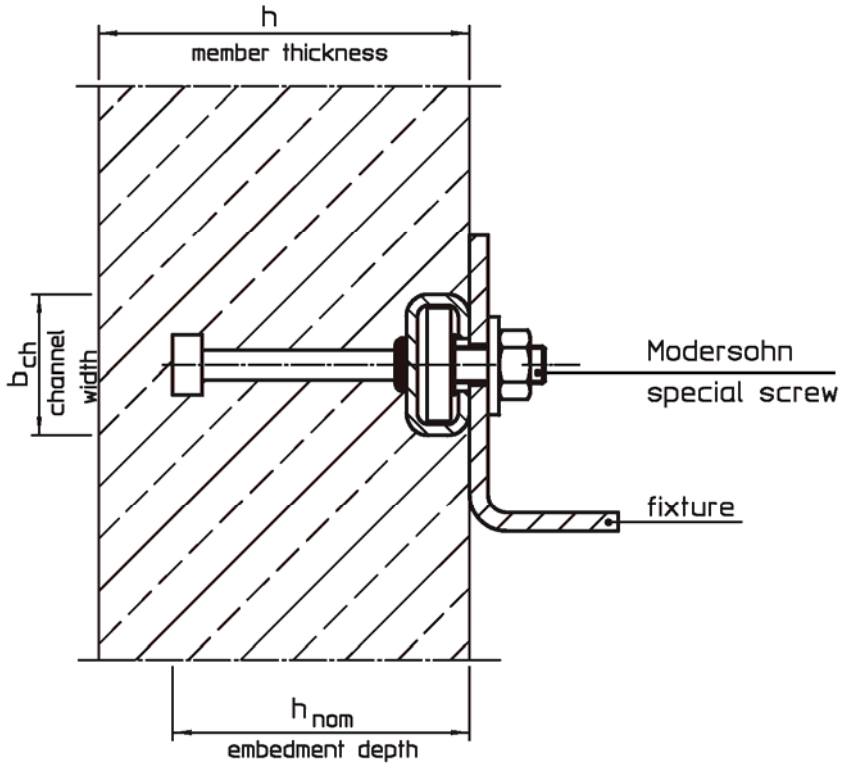

Modersohn Anchor Channel MBA	Annex 1
Product and intended use	

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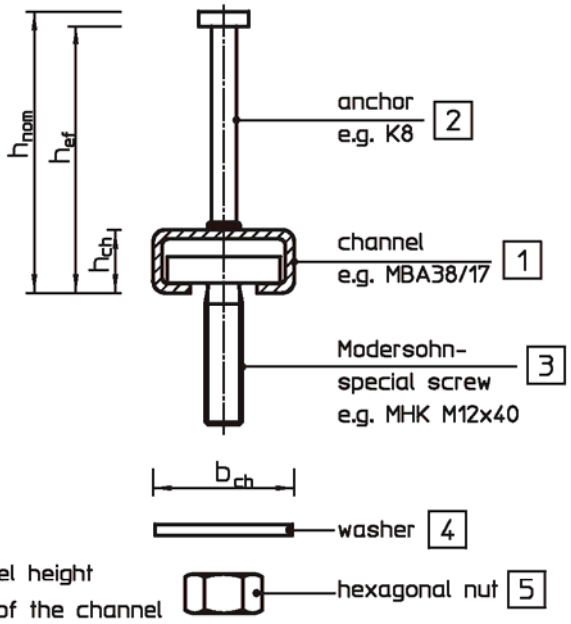
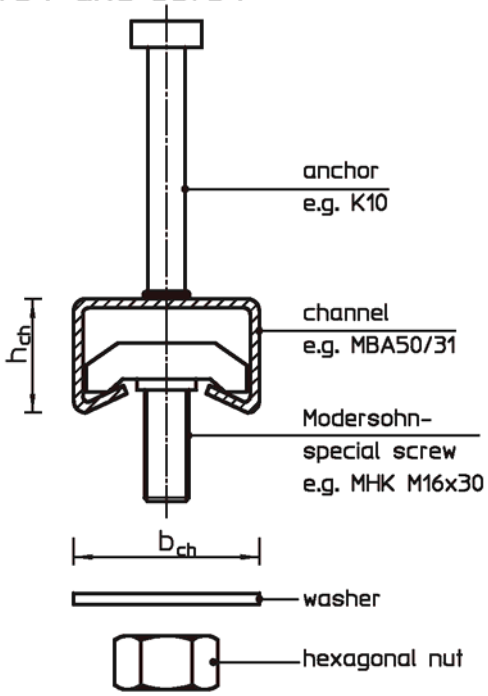
Anchor channel

Profile 28/15 and 38/17



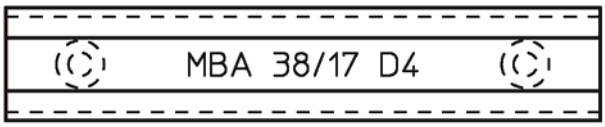
Profile 40/25, 50/31, 52/34 and 53/34



legend

h_{ch}	channel height
b_{ch}	width of the channel
h_{ef}	effective anchorege depth
h_{nom}	empedment depth

Marking of the Modersohn anchor channel e.g.:



stumped on back of channel:

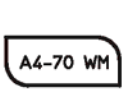
M	identifying mark of the producer
BA	type of anchor channel
38/17	size
D4	material

Close to the anchor a nail hole is positioned.

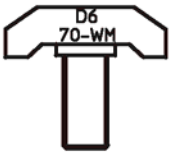
Material of channels:

D4	1.4362 / 1.4062 / 1.4482 / 1.4162
D6	1.4462

Marking of the Modersohn special screw e.g.:



for corrosion resistance class III



for corrosion resistance class IV

WM	identifying mark of the producer
A4	material
70	strength grade

Material of the special screws:

A4-50	1.4401 / 1.4404 / 1.4571 / 1.4578 (FK-50)
A4-70	1.4401 / 1.4404 / 1.4571 / 1.4578 (FK-70)
D4-70	1.4362 / 1.4062 / 1.4482 / 1.4162 (FK-70)
D6-70	1.4462 (FK-70)

Modersohn Anchor Channel MBA	Annex 2
Product and marking	

Deutsches Institut für Bautechnik DIBt

Table 1: Materials and intended use

item no.	specification	intended use	
		1	2
		medium corrosion exposure	high corrosion exposure
		Anchor channels may be used in structures subject to internal conditions. They may also be used in structures subject to external atmospheric exposure (including industrial and marine atmosphere) and in permanently damp internal conditions, if no particular aggressive conditions (e.g. permanent dipping into seawater etc. acc. column 2) exist.	Anchor channels may also be used in structres subject to exposure in particular aggressive conditions (e.g. permanent dipping into seawater, the splash zone of seawater or an atmosphere with chemical pollution e.g. in desulphurization plants or road tunnels where deicing materials are used).
		materials	
1	channel profile	stainless steel 1.4362 / 1.4062 / 1.4482 / 1.4162 EN 10088	stainless steel 1.4462 [1] EN 10088
2	anchor	stainless steel 1.4301 / 1.4401 / 1.4404 / 1.4571 EN 10088	stainless steel 1.4362 / 1.4401 / 1.4404 / 1.4571 EN 10088
3	Modersohn special screw, shaft and thread according to EN ISO 4018	stainless steel 1.4401 / 1.4404 / 1.4571 1.4362 EN ISO 3506-1	stainless steel 1.4462 [1] EN ISO 3506-1
4	washer, EN ISO 7089 and EN ISO 7093-1 production class A, 200HV	stainless steel 1.4401 / 1.4404 / 1.4571 EN 10088	stainless steel 1.4462 [1] EN 10088
5	hexagonal nuts EN ISO 4032	stainless steel 1.4401 / 1.4404 / 1.4571 EN ISO 3506-2	stainless steel 1.4462 [1] EN ISO 3506-2

1) 1.4462 not applicable for indoor swimming-pools

Modersohn Anchor Channel MBA	Annex 3
Materials and intended use	

Deutsches Institut für Bautechnik DIBt

Fig. 1

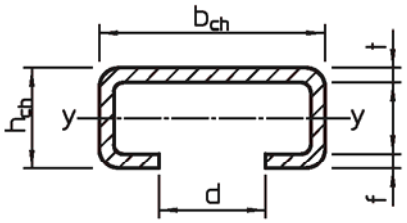


Fig. 2

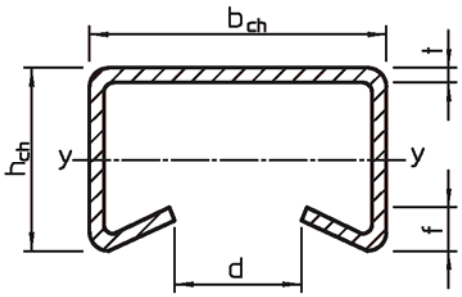
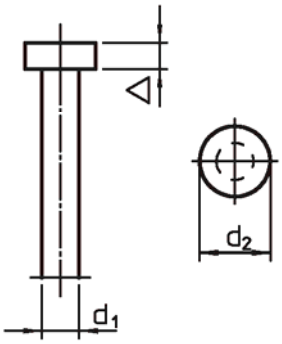


Table 2: Geometrical profile properties

anchor channel	figure	dimensions					moment of inertia
		b_{ch}	h_{ch}	t	d	f	I_y
		[mm]					[mm⁴]
28/15	1	28,00	15,00	2,30	12,00	2,30	3874
38/17	1	38,00	17,00	3,00	18,00	3,00	7787
40/25	2	40,00	25,00	2,50	18,00	5,50	19095
50/31	2	50,00	31,00	3,00	22,00	7,35	44781
52/34	2	52,00	34,00	4,00	22,00	7,80	70663
53/34	2	53,00	34,00	4,50	22,00	7,70	76681

Table 3: Types of anchors

type	anchor channel	shaft ød_1	head ød_2	head thickness △
		[mm]		
K6	28/15	6	13	5
K8	38/17, 40/25	8	16	5
K10	50/31	10	19	7
K13	52/34, 53/34	13	25	8



Modersohn Anchor Channel MBA	Annex 4
Geometrical profile properties, types of anchor	

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Anchor positioning and channel length

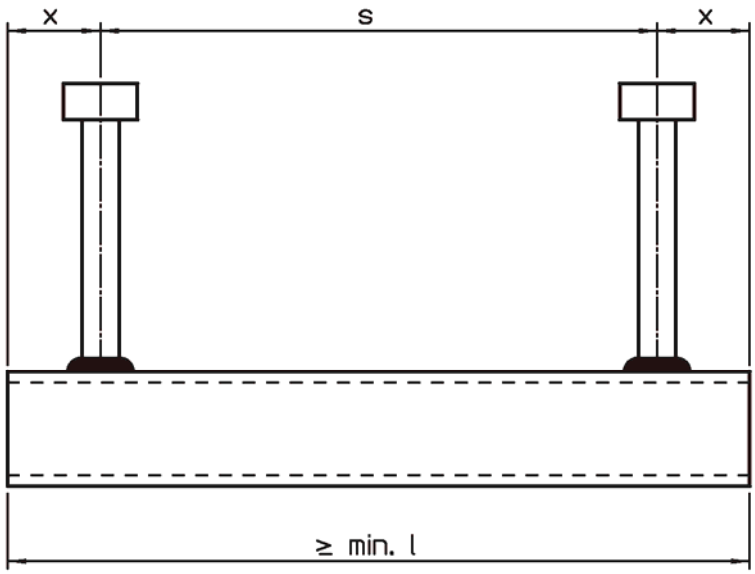


Table 4: Anchor positioning, channel length

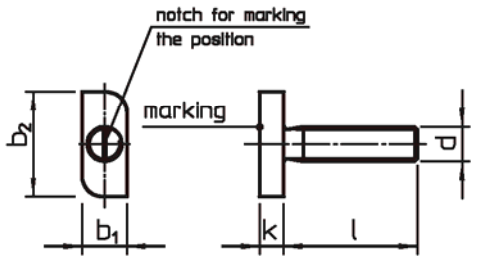
anchor channel	anchor spacing		end spacing	min. channel length
	s_{min}	s_{max}	x	min. l
	[mm]			
28/15 38/17	50	200	25	100
40/25 50/31	50	250	25	100
52/34 53/34	80	250	35	150

Modersohn Anchor Channel MBA	Annex 5
Anchor positioning, channel lenght	

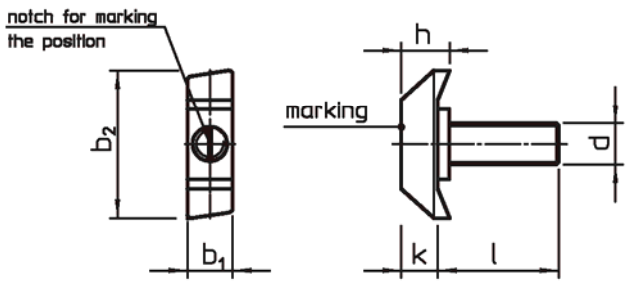
Deutsches Institut für Bautechnik DIBt

Modersohn special screws

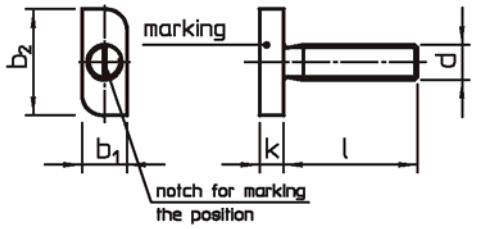
hammer head geometry



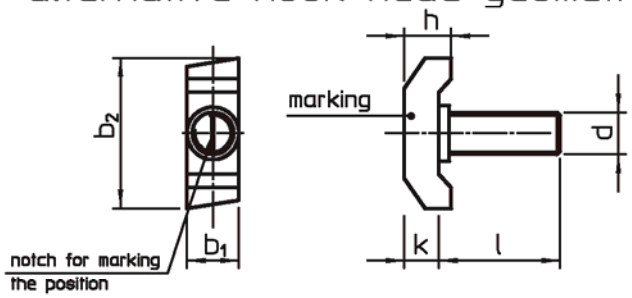
hook head geometry



alternative hammer head geometry



alternative hook head geometry



marking acc. annex 2

Table 5: Dimensions, special screws, hammer head [mm]

		special screws, hammer head (corrosion resistance class III)			special screws, alt. hammer head geometry (corrosion resistance class IV)				
MHK	thread ø	width b_1	length b_2	thickness k	width b_1	length b_2	thickness k	length l	anchor channel
28/15	M10	10,5	22,5	4,5	10	22,5	6	20-200	28/15
38/17	M10	14,1	30,5	7	15	30,5	7	20-200	38/17
38/17	M12	14,1	30,5	7	15	30,5	7	20-200	

Table 5a: Dimensions, special screws, hook head [mm]

		special screws, hook head (corrosion resistance class III)				special screws, alt. hook head geometry (corrosion resistance class IV)					
MHK	thread ø	width b_1	length b_2	thickness k	thickness all h	width b_1	length b_2	thickness k	thickness all h	length l	anchor channel
40/25	M10	14	33,7	8	10,5	15	33,7	10	12,5	20-150	
40/25	M12	14	33,7	8	10,5	15	33,7	11	13,5	20-200	40/25
40/25	M16	17	32,7	9	12					30-200	
50/30	M12	13	43,3	10	13,5	15	43,3	12	15,5	20-200	50/31
50/30	M16	17	43,3	11	14,5	20	43,3	14	17,5	30-200	52/34
50/30	M20	21	43,3	12	15,5	20	43,3	15	18,5	30-200	53/34

Table 6: Strength grade

strength grade	A4-50	A4-70
f_{uk} [N/mm²]	500	700
f_{yk} [N/mm²]	210	450

Modersohn Anchor Channel MBA	Annex 6
Modersohn special screws Dimensions, strength grade	

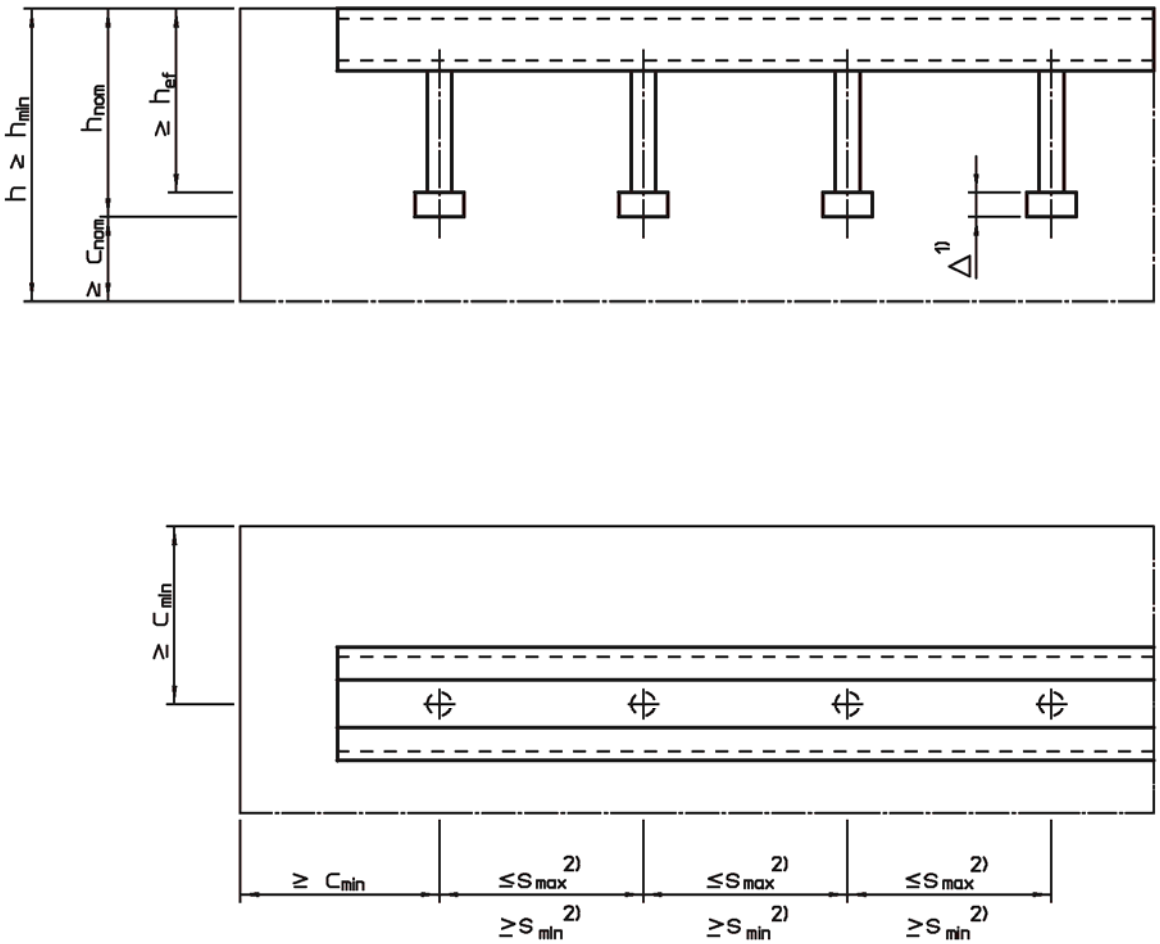


Table 7: Minimum anchorage depth, edge distance and member thickness

anchor channel			28/15	38/17	40/25	50/31	52/34	53/34
min. anchorage depth	[mm]	min. h_{ef}	45	72	80	99	151	151
min. edge distance		c_{min}	40	50	50	75	100	100
min. member thickness		h_{min}	$h_{ef} + \Delta^{1)} + c_{nom}^{3)}$					

1) △ = anchor head thickness
2) s_{min} , s_{max} acc. Annex 5, Table 4
3) $c_{nom} \geq 30mm$

Modersohn Anchor Channel MBA	Annex 7
Installation parameters of Modersohn Anchor Channel	

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Table 8: Minimum spacing and setting torque of Modersohn special screws

anchor channel	Modersohn special screws ø	min. spacing $s_{min,a}$ [4] of the Modersohn special screws	setting torque T_{inst} [5]			
			general [2]		steel-steel contact [3]	
			A4-50 [1]	A4-70 [1]	A4-50 [1]	A4-70 [1]
	[mm]	[mm]	[Nm]			
28/15	10	50	-	13	-	40
38/17	10	50	-	15	-	40
	12	60	-	25	-	70
40/25	10	50	15	-	15	-
	12	60	25	-	25	-
	16	80	45	-	65	-
50/31	12	60	25	-	25	-
	16	80	60	-	65	-
	20	100	75	-	130	-
52/34 53/34	12	60	25	-	25	-
	16	80	60	-	65	-
	20	100	120	-	130	-

1) materials acc. Annex 3, Table 1
2) acc. Annex 9, Fig. 1
3) acc. Annex 9, Fig. 2
4) acc. Annex 10, Fig. 1
5) T_{inst} must not be exceeded

Modersohn Anchor Channel MBA	Annex 8
Installation parameters of Modersohn special screw	

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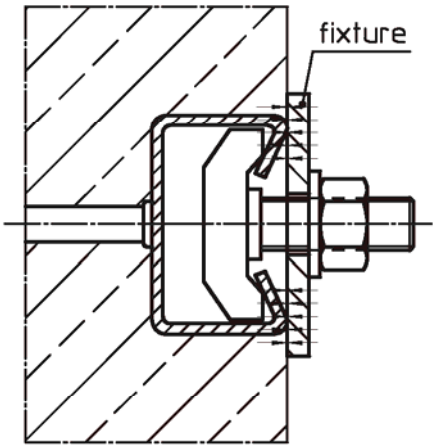
General

The fixture is braced to concrete or to the anchor channel respectively braced to concrete and anchor channel. The setting torques according to Annex 8, Table 8 shall be applied and must not be exceeded.

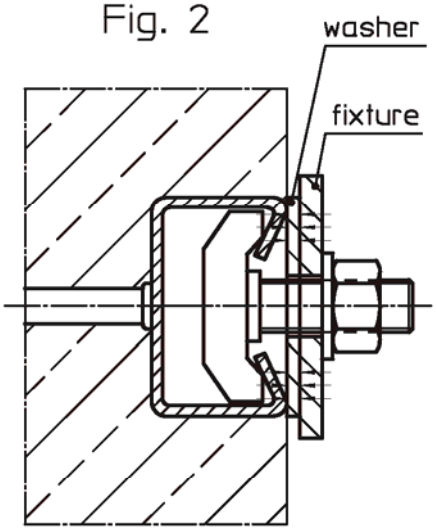
Fig. 1



Steel-steel contact

The fixture is braced to the anchor channel by suitable washer. The setting torques according to Annex 8, Table 8 shall be applied and must not be exceeded.

Fig. 2



Modersohn Anchor Channel MBA	Annex 9
Positions of the fixture	

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Table 9: Characteristic values for tension loads – steel failure channel

anchor channel			28/15	38/17	40/25	50/31	52/34 53/34
steel failure, anchor							
characteristic resistance	$N_{Rk,s,a}$	[kN]	not relevant				
partial safety factor	γ_{Ms} 1)		1,8				
steel failure, connection channel anchor							
characteristic resistance	$N_{Rk,s,c}$	[kN]	18	28	20	32	76
partial safety factor	$\gamma_{Ms,ca}$ 1)		1,8				
steel failure, local flexure of channel lips for $s_s \geq s_{slb}$							
spacing of Modersohn special screws for $N_{Rk,s,l}$	s_{slb}	[mm]	40	48	64	73	81
characteristic resistance	$N_{Rk,s,l}$	[kN]	18	28	20	32	76
partial safety factor	$\gamma_{Ms,l}$ 1)		1,8				
steel failure, local flexure of channel lips for $s_{slb} \geq s_s \geq s_{min,s}$ 2)							
characteristic resistance	$N_{Rk,s,l}$	[kN]	$0{,}5 \cdot (1+s_s/s_{slb}) \cdot N_{Rk,s,l} \leq N_{Rk,s,c}$				
partial safety factor	$\gamma_{Ms,l}$ 1)		1,8				

1) in absence of other national regulations
2) $s_{min,s}$ acc. to Annex 8, Table 8

Fig. 1: Spacing

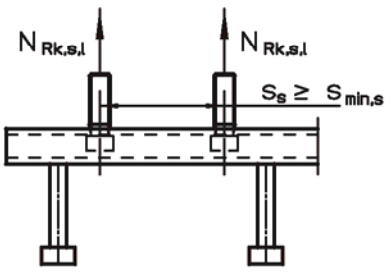

Fig. 2: Assumption of system

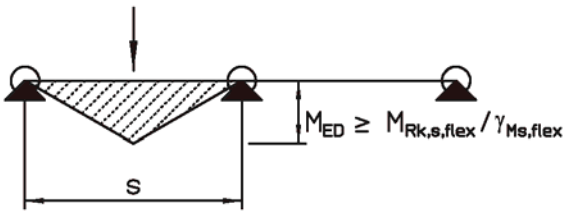

Table 10: Flexure resistance of channel

anchor channel			28/15	38/17	40/25	50/31	52/34	53/34
charcteristic flexure resistance of channel	$M_{Rk,s,flex}$	[Nm]	432	836	1262	2528	3297	3297
partial safety factor	$\gamma_{Ms,flex}$ 1)		1,15					

1) in absence of other national regulations

Modersohn Anchor Channel MBA	Annex 10
Characteristic values for tension loads Steel failure channel	

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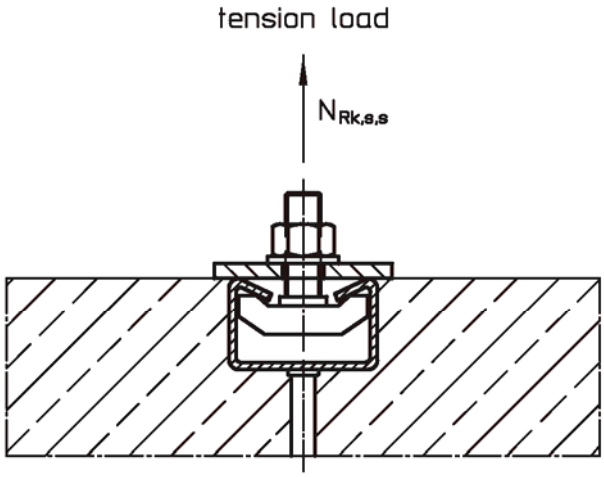
Table 11: Characteristic values for tension load – steel failure of Modersohn special screws

Modersohn special screw ø				28/15 A4-70[1)]	38/17 A4-70[1)]	40/25 A4-50[1)]	50/30 A4-50[1)]
Steel failure							
characteristic resistance	$N_{Rk,s,s}$[2)]	[kN]	M10	35,5	40,6	25,4	-
			M12	-	52,6	41,9	42,2
			M16	-	-	64,1	78,5
			M20	-	-	-	102,2
partial safety factor	$\gamma_{Ms,s}$[3)]		A4-50[1)]	2,86			
			A4-70[1)]	1,87			

1) materials according to Annex 3, Table 1
2) in conformity to EN ISO 898-1: 1999
3) in absence of other national regulations



Modersohn Anchor Channel MBA	Annex 11
Characteristic values for tension loads Steel failure of Modersohn special screws	

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Table 12: Characteristic values for tension loads – concrete failure

anchor channel				28/15	38/17	40/25	50/31	52/34 53/34
pullout failure								
characteristic resistance in cracked concrete C12/15	round anchors	$N_{Rk,p}$	[kN]	9,4	13,6	13,6	18,4	32,2
increasing factor for $N_{Rk,p}$	C20/25	Ψ_c	[–]	1,67				
	C25/30			2,00				
	C30/37			2,47				
	C35/45			3,00				
	C40/50			3,33				
	C45/55			3,67				
	≥C50/60			4,00				
		$\Psi_{ucr,N}$		1,4				
partial safety factor		$\gamma_{Mp} = \gamma_{Mc}$ 1)		1,5				
concrete cone failure $N^0_{Rk,c}$ see CEN/TS 1992-4-3 section 6.2.5								
		α_{ch}		0,81	0,87	0,89	0,91	0,97
effective anchorage depth		h_{ef}	[mm]	45	72	80	99	151
chracteristic edge distance		$C_{cr,N}$		111	164	178	206	258
characteristic spacing		$S_{cr,N}$		223	328	356	413	516
		$\Psi_{ucr,N}$		1,4				
partial safety factor		γ_{Mc} 1)		1,5				
splitting								
				verification of splitting is not relevant				

1) in absence of other national regulations

Table 13: Displacements under tension loads

anchor channel			28/15	38/17	40/25	50/31	52/34 53/34
tension load	N_{EK}	[kN]	4,2	7,6	9,9	18,7	29,2
short time displacement	σ_{N0}	[mm]	0,4	0,4	0,5	0,5	0,6
long time displacement	σ_N	[mm]	1,6	1,6	1,6	1,6	1,6

Modersohn Anchor Channel MBA	Annex 12
Characteristic values for tension loads Concrete failure and displacement	

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Table 14: Characteristic values for shear loads – steel failure of the channel and concrete failure

anchor channel				28/15	38/17	40/25	50/31	52/34 53/34
steel failure, local flexure of channel lip								
characteristic resistance		$V_{Rk,s,l}$	[kN]	18	30	31	59	74
partial safety factor		$\gamma_{Ms,l}$ [1]		1,8				
pry out failure								
factor k in equation (31) of CEN/TS 1992-4-3		k_5 [3]		2,0				
partial safety factor		γ_{Mc} [1]		1,5				
concrete edge failure								
product of factor α_p and $\Psi_{re,V}$	cracked concrete without edge reinforcement or stirrups	$\alpha_p \cdot \Psi_{re,V}$		2,5	3,5	4,0	4,0	4,0
	cracked concrete with straight edge reinforcement (≥ø 12mm)	$\alpha_p \cdot \Psi_{re,V}$		3,0	4,2	4,8	4,8	4,8
	non-cracked concrete[2] or cracked concrete with edge reinforcement and stirrups with a spacing $a \le 100mm$ and $a \le 2 \cdot c_1$	$\alpha_p \cdot \Psi_{re,V}$		3,5	4,9	5,6	5,6	5,6
effect of the thickness of the structural component		$\alpha_{h,V}$		$(h/h_{cr,V})^{0,5}$				
characteristic height		$h_{cr,V}$		$2 \cdot c_1 + 2 \cdot h_{ch}$				
characteristic edge distance		$c_{cr,V}$		$2 \cdot c_1 + b_{ch}$				
characteristic spacing		$s_{cr,V}$		$4 \cdot c_1 + 2 \cdot b_{ch}$				
partial safety factor		γ_{Mc} [1]		1,5				

1) in absence of other national regulations
2) proof according to CEN/TS 1992-4-1: 2009, section 5
3) without supplementary reinforcement. In case of supplementary reinforcement the faktor k_5 should be multiplied with 0,75

Modersohn Anchor Channel MBA	Annex 13
Characteristic values for shear loads Shear loads - anchor channel and concrete	

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Table 15: Characteristic values for shear load – steel failure of Modersohn special screws

Modersohn special screw ø				M10	M12	M16	M20
steel failure							
characteristic resistance	$V_{Rk,s,s}$ [2]	[kN]	A4-50 [1]	17,4	25,3	47,1	73,5
			A4-70 [1]	24,4	35,4	65,9	102,9
characteristic flexure resistance	$M^0_{Rk,s,s}$	[Nm]	A4-50 [1]	37,4	65,5	166,5	324,5
			A4-70 [1]	52,3	91,7	233,1	454,4
partial safety factor	$\gamma_{Ms,s}$ [3]		A4-50 [1]	2,38			
			A4-70 [1]	1,56			

1) materials according to Annex 3, Table 1
2) in conformity to EN ISO 898-1: 1999
3) in absence of other national regulations

Table 16: Displacements under shear loads

anchor channel			28/15	38/17	40/25	50/31	52/34 53/34
shear load	V_{EK}	[kN]	2,7	7,8	7,6	9,4	16,2
short time displacement	σ_{V0}	[mm]	0,4	0,6	0,6	0,8	0,9
long time displacement	σ_V	[mm]	0,6	0,9	0,9	1,2	1,4

Modersohn Anchor Channel MBA	Annex 14
Characteristic values for shear loads Steel failure special screws and displacements	

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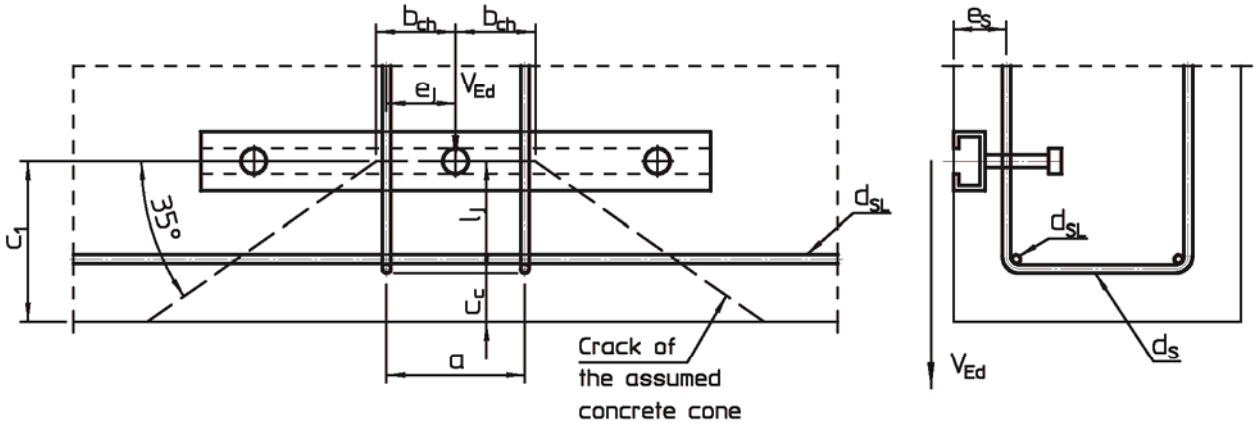
Verification for anchor channels for shear loads in reinforced parts (only for loading perpendicular to the edge)



$$V_{Ed} \leq V_{Rd,re} = V_{Rk,re} / \gamma_{Mc} \qquad V_{Ed} = \max [V_{Ed} ; V^a_{Ed}] \tag{1}$$

$$V_{Rk,re} = V_{Rk,c,re} / x \tag{2}$$

$$V_{Rk,c,re} = V_{Rk,c,hook} + V_{Rk,c,bond} \leq V_{Rk,c,re,max} \leq \sum_{m+n} A_s \cdot f_{y,k} \tag{3}$$

$$V_{Rk,c,hook} = \sum_{j=1}^{m} \left(\psi_1 \cdot \psi_3 \cdot \psi_4 \cdot A_s \cdot f_{y,k} \cdot \left(\frac{f_{c,k}}{30} \right)^{0,1} \right) + \sum_{j=1}^{n} \left(\psi_2 \cdot \psi_3 \cdot \psi_4 \cdot A_s \cdot f_{y,k} \cdot \left(\frac{f_{c,k}}{30} \right)^{0,1} \right) \tag{4}$$

$$V_{Rk,c,bond} = \sum_{j=1}^{m+n} (\pi \cdot d_s \cdot l_j \cdot f_{b,k}) \tag{5}$$

$$V_{Rk,c,re,max} = 4,2 \cdot c_1^{-0.12} \cdot V_{Rk,c} \tag{6}$$

$$V_{Rk,c} = V^0_{Rk,c} \cdot \alpha_{s,V} \cdot \alpha_{c,V} \cdot \alpha_{h,V} \tag{7}$$

Reinforcement requirements

$$50mm \leq a \leq \begin{cases} s \\ 150mm \\ (c_1 - c_c + 0,7 \cdot b_{ch} - 4 \cdot d_s) / 0,35 \\ c_1 - c_c \end{cases} \tag{8}$$

$$6mm \leq d_s \leq 20mm \tag{9}$$

Modersohn Anchor Channel MBA	Annex 15
Varification for shear loads with reinforcement	

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ψ_1 = effectiveness factor
= 0,67 for stirrups directly besides a shear load ①
- for a stirrup at the location of a shear load ③
- for a stirrup between 2 shear loads acting on an anchor channel ②
  (distance between the loads $p \le s_{cr,v}$, according to Table 14)

ψ_2 = effectiveness factor
= 0,11 for other stirrups in the concrete cone ④

$\psi_3 = (d_{s,\perp} / d_s)^{2/3}$

d_s = diameter of stirrup [mm]

$d_{s,\perp}$ = diameter of edge bars [mm]

$\psi_4 = \left(\frac{l_j}{c_1}\right)^{0,4} \cdot \left(\frac{10}{d_s}\right)^{0,25}$

l_j = anchorage length of a stirrup leg in the concrete cone [mm]
= $c_1 - c_c - 0,7 \cdot (e_j - b_{ch})$[mm] for stirrups crossed diagonally by the assumed crack
= $c_1 - c_c$ [mm] for stirrups directly under the load or for stirrups crossed orthogonally by the assumed crack
$\ge 4 \cdot d_s$

c_1 = edge distance [mm]

c_c = concrete cover [mm]

e_j = distance of the stirrup leg to the point of load action [mm]

b_{ch} = width of the anchor channel [mm] (according to Table 2)

A_s = cross section of one leg of the stirrup [mm²]

f_{yk} = characteristic yield strength of the reinforcement [N/mm²]

f_{ck} = characteristic concrete strength measured on cubes with a side length of 150mm [N/mm²]

f_{bk} = characteristic bond strength [N/mm²]

m = number of stirrups in the assumed concrete cone with ψ_1

n = number of stirrups in the assumed concrete cone with ψ_2

a = spacing of stirrups

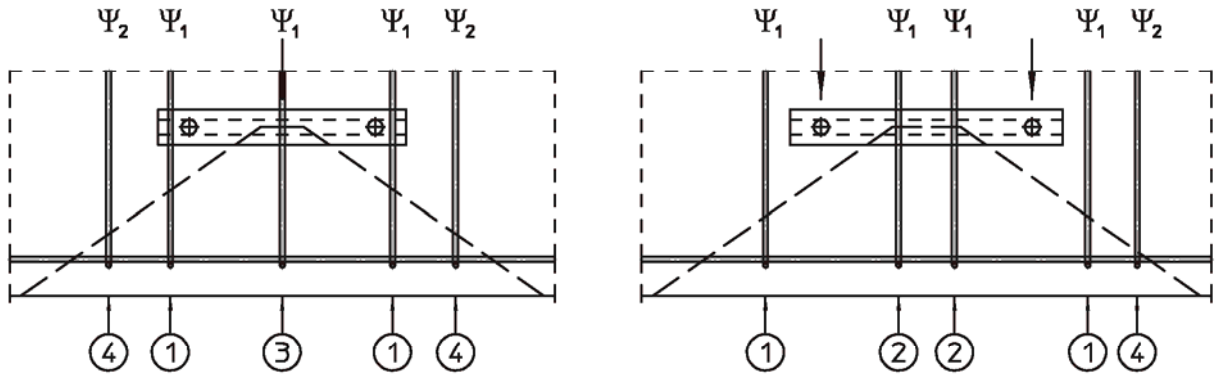
x = $e_s / z + 1$
factor taking into account accentricity between reinforcement force and load

e_s = distance between reinforcement and shear force acting on the anchor channel

z = inner lever arm ≈0,85d [mm]; d = $\min(2 \cdot h_{ef}; 2 \cdot c_1)$

$V^0_{Rk,c}$ = acc. CEN/TS 1992-4-3:2009, section 6.3.5.3

V^a_{Ed} = acc. CEN/TS 1992-4-3:2009, section 3.2.2



Modersohn Anchor Channel MBA	Annex 16
Model for reinforcement under shear loading towards the edge	

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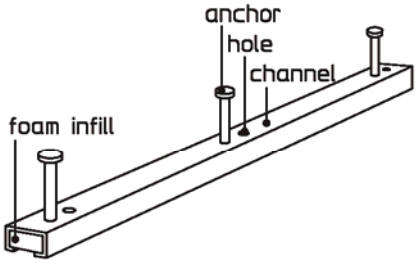
Instructions for fixing the Modersohn anchor channel

Modersohn anchor channels are filled with foam and have pre punched holes in the back. The foam is to be cut flush to the edge of the channel. The channels should be installed according to the reinforcement plans and even with the concrete surface. To avoid displacing them, the anchor channels have to be fixed to the formwork while pouring the concrete.



Fixing anchor channel to formwork

Steel formwork:

Figure A:
Fixing the anchor channel to the steel formwork with Modersohn special screws and nuts.

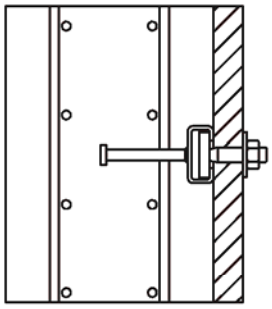


Figure A

Figure B:
Fixing the anchor channel to the formwork with rivets through the pre punched holes in the back of the channels.

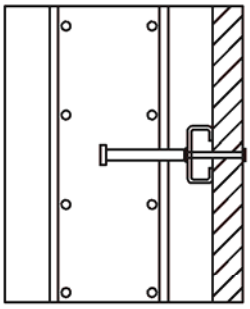


Figure B

Timber formwork:

Figure C:
Fixing the anchor channel to the timber formwork with nails through the pre punched holes in the back of the channel. Stainless steel channels and channels in external use are to be fixed with stainless steel nails.

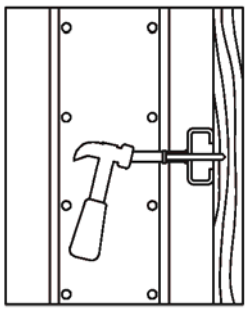


Figure C

Figure D:
Fixing the anchor channel to the timber formwork with staples.

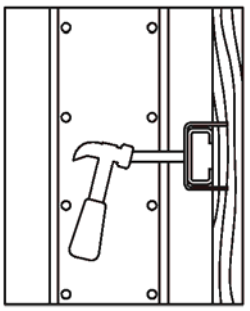
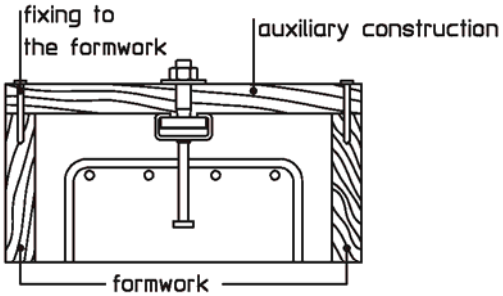


Figure D

Fixing anchor channels at the top

If the anchor channel is installed on the top of the member, it must be fixed to an auxiliary construction, e.g. with a Modersohn special screw. This auxiliary construction prevents the displacing or slipping of the anchor channel while compacting the concrete.



Modersohn Anchor Channel MBA	Annex 17
Manufacturer's spezification	

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Regular compacting of concrete

1. Figure E:
If anchor channels are installed at the side of a member, the concrete below the anchor channel must be thoroughly compacted. Improper compacting of the concrete can lead to air entrapments and thereby a reduced load capacity.

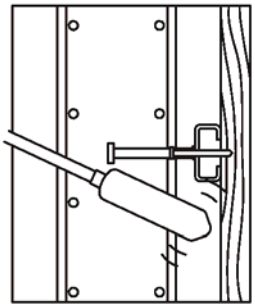


Figure E

2. Figure F:
When installing an anchor channel at the bottom side of a member, the concrete needs to be compacted thoroughly to ensure a sufficient bonding.

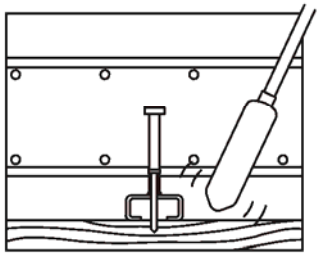


Figure F

3. Figure G:
Anchor channels installed on the top of a member must be fixed to an auxiliary construction to prevent displacing or slipping. A suitable vibrator has to be used to compact the concrete. If you press the anchor channel into the concrete, you have to compact the concrete with a vibrator!

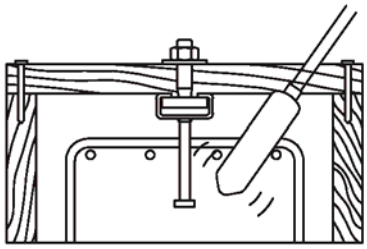
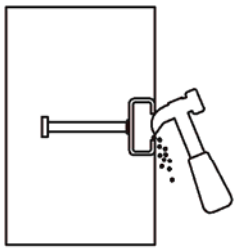
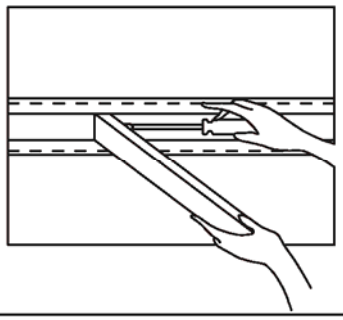


Figure G

How to remove the channel infill

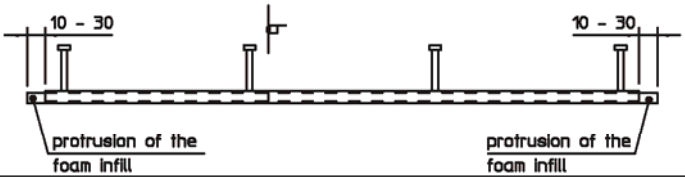
After dismantling the formwork remove the fixing material and the remaining concrete. Next remove the foam infill with a suitable tool e.g. a screw driver.





Cutting to size long anchor channels

Modersohn anchor channels will be delivered prefabricated. The channels can be cut to size at the construction site. Then please follow the instructions:



1. Every piece of channel must have at least two anchors.
2. The channel must be cut acc. Annex 5 Table 4.
3. The foam infill must be cut flush to the edge of the channel before installing.

Modersohn Anchor Channel MBA	Annex 18
Manufacturer's spezification	

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Fastening the Modersohn special screw to the anchor channel

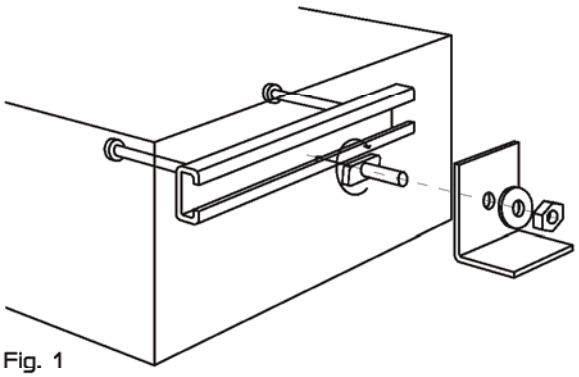

Fig. 1

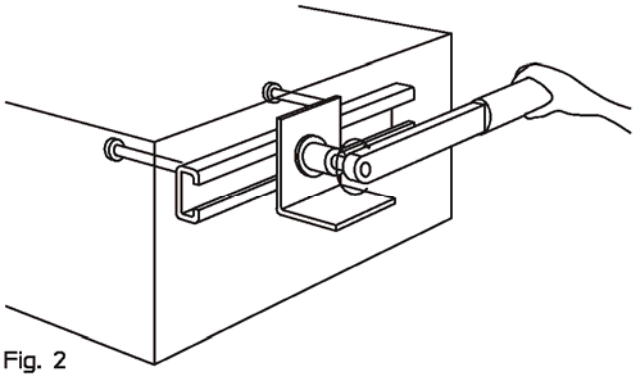

Fig. 2

a) Torque (general)

1. Insert the Modersohn special screw into the horizontal slot of the channel (Fig. 1).
2. Turn the special screw 90° in clockwise direction, then the head of the screw locks into position (Fig. 1).
3. Minimum distance to the edge of the channel is to be set acc. Annex 5, Table 4.
4. Place the washer under the nut (Fig. 1).
5. Check if the Modersohn special screw is installed correctly. The notch on the bottom of the threaded bolt of the screw must be set crosswise to the longitudinal axis.
6. Tighten the nut with the torque mentioned in Table 17 (Fig. 2). The torque must not be exceeded.

	Anchor channel	T_{inst} [Nm]			
		M10	M12	M16	M20
strength grade A4-50 A4-70	28/15	13	-	-	-
	38/17	15	25	-	-
	40/25	15	25	45	-
	50/31	-	25	60	75
	52/34 53/34	-	25	60	120

Table 17

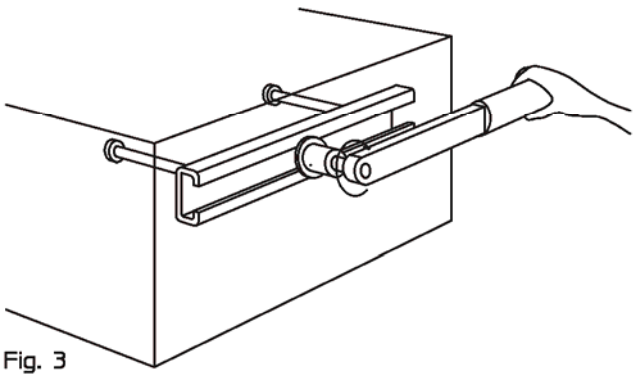

Fig. 3

b) Torques (steel-to-steel contact)

1. Place a washer between the channel and the attachment to create a defined contact.
2. Tighten the nut with the torque mentioned in Table 18. The torque must not be exceeded.

strength grade	T_{inst} [Nm]			
	M10	M12	M16	M20
A4-50	15	25	65	130
A4-70	40	70	-	-

Table 18

Modersohn Anchor Channel MBA	Annex 19
Manufacturer's spezification	