

# National technical approval

## MAX FRANK Coupler

Z-1.5-282 | 26.09.2019 | english

Mechanical screw couplers and anchorages for reinforcing steel bars,

Nominal diameter: 12 to 40 mm

tested by: DIBt Deutsches Institut für Bautechnik, Berlin

## Decision

amending and supplementing the national  
technical approval /  
general construction technique permit  
of 4 March 2019

Zulassungsstelle für Bauprodukte und Bauarten  
Bautechnisches Prüfamt

Eine vom Bund und den Ländern  
gemeinsam getragene Anstalt des öffentlichen Rechts  
Mitglied der EOTA, der UEAtc und der WFTAO

Date: 26 Sep 2019      Reference number:  
I 24-1.1.5-24/19

Approval number:  
**Z-1.5-282**

Validity  
from: **26 September 2019**  
to: **4 March 2024**

Applicant:  
**Max Frank GmbH & Co. KG**  
Mittlerweg 1  
94339 Leiblfing, Germany

Subject of approval:  
**Mechanical screw couplers and anchorages for reinforcing steel bars**  
**'Max Frank Coupler'**  
**Nominal diameter: 12 to 40 mm**

This decision amends and supplements national technical approval (*allgemeine bauaufsichtliche Zulassung*) / general construction technique permit (*allgemeine Bauartgenehmigung*) no. Z-1.5-282 of 4 March 2019.

This decision contains three pages and four annexes. This decision applies only in conjunction with the above-mentioned national technical approval / general construction technique permit and shall not be used without it.

Translation authorised by DIBt

DIBt

## REGARDING I      GENERAL PROVISIONS

The general provisions of national technical approval / general construction technique permit no Z-1.5-282 are replaced by the following version:

- 1      This decision confirms the fitness for use and application of the subject concerned within the meaning of the Building Codes of the federal states (*Landesbauordnungen*).
- 2      This decision does not replace the permits, approvals and certificates required by law for carrying out construction projects.
- 3      This decision is granted without prejudice to the rights of third parties, in particular private property rights.
- 4      Notwithstanding further provisions in the 'Special Provisions', copies of this decision shall be made available to the user and installer of the subject concerned. The user and installer of the subject concerned shall also be made aware that this decision must be made available at the place of use or place of application. Upon request, copies of the decision shall be provided to the authorities involved.
- 5      This decision shall be reproduced in full only. Partial publication requires the consent of DIBt. Texts and drawings in promotional material shall not contradict this decision. In the event of a discrepancy between the German original and this authorised translation, the German version shall prevail.
- 6      This decision may be revoked. The provisions contained herein may subsequently be supplemented and amended, in particular if this is required by new technical findings.
- 7      This decision is based on the information and documents provided by the applicant. Alterations to this basis are not covered by this decision and shall be notified to DIBt without delay.
- 8      The general construction technique permit included in this decision also serves as a national technical approval for the construction technique.

**Decision amending and supplementing the national  
technical approval /  
general construction technique permit  
No. Z-1.5-282**

**Page 3 of 3 | 26 September 2019**

## **REGARDING II      SPECIAL PROVISIONS**

The special provisions of the national technical approval / general construction technique permit are amended and supplemented as follows:

Annexes 1 to 4 of the national technical approval / general construction technique permit are replaced by Annexes 1a to 4a of this decision.

Beatrix Wittstock  
Head of Section

Drawn up by

## National technical approval / General construction technique permit

Zulassungsstelle für Bauprodukte und Bauarten  
Bautechnisches Prüfamt

Eine vom Bund und den Ländern  
gemeinsam getragene Anstalt des öffentlichen Rechts  
Mitglied der EOTA, der UEAtc und der WFTAÖ

Date:

4 Mar 2019

Reference:

I 24-1.1.5-30/17

**Number:**

**Z-1.5-282**

**Applicant:**

**Max Frank GmbH & Co. KG**  
Mitterweg 1  
94339 Leiblfing, Germany

**Validity**

from: **4 March 2019**

to: **4 March 2024**

**Subject of decision:**

**Mechanical screw couplers and anchorages for reinforcing steel bars  
'Max Frank Coupler'  
Nominal diameter: 12 to 40 mm**

The subject named above is herewith granted a national technical approval (*allgemeine bauaufsichtliche Zulassung*) / general construction technique permit (*allgemeine Bauartgenehmigung*). This decision contains seven pages and five annexes.

Translation authorised by DIBt

DIBt

## I GENERAL PROVISIONS

- 1 This decision confirms the fitness for use and application of the subject concerned within the meaning of the Building Codes of the federal states (*Landesbauordnungen*).
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- 7 This decision is based on the information and documents provided by the applicant. Alterations to this basis are not covered by this decision and shall be notified to DIBt without delay.
- 8 The general construction technique permit included in this decision also serves as a national technical approval for the construction technique.

## II SPECIAL PROVISIONS

### 1 Subject concerned and field of use and/or application

The subject concerned is screw couplers and screwed-on anchoring elements for mechanical coupling and anchoring in accordance with DIN EN 1992-1-1, Clauses 8.4 and 8.7. The coupling and anchoring elements, hereinafter referred to as 'Max Frank Coupler', maybe used with reinforcing steel bars B500B with a nominal diameter of 12 to 40 mm in accordance with DIN 488-1:2009.

The screw couplers have metric internal threads. The bar ends to be connected or anchored are provided with metric external threads.

The bar ends are screwed into the internal threads of the couplers and locked in the coupling threads to a specified torque to reduce the slip. The rebar connection is primarily used for force transmission in construction joints.

The 'Max Frank Coupler' system allows the following rebar coupling / rebar anchoring variants:

- standard coupler where the connecting rebar can move along the axis and rotate freely,
- positional coupler where the movement of the connecting bar is restricted (e.g. cannot be rotated because bent or offset and/or cannot move along the axis),
- transition coupler for connecting rebars with different, neighbouring nominal diameters in the diameter series defined in DIN 488-2:2009-08; connection of bars 28/20, 32/25 and 40/28 mm is also possible,
- end anchor for transmission of the rebar forces into the concrete.

### 2 Provisions for the construction product

#### 2.1 Properties and composition

The materials used for the coupling and anchoring elements and the geometrical dimensions of the couplers, coupling elements and anchoring elements are given in Annexes 1 to 4. The requirements regarding the material properties given in the relevant standards and in the deposited data sheet shall be met. The characteristic values for the mechanical behaviour, treatment conditions and chemical compositions of the materials used as deposited with the external surveillance body and DIBt shall be adhered to. The shop drawings including tolerance specifications are deposited with DIBt and the external surveillance body.

#### 2.2 Manufacture, packaging, transport, storage and marking

##### 2.2.1 Manufacture

The intermediate materials for the coupling and anchoring elements are blanks that are cut and provided with metric internal threads in the manufacturing plant.

The ends of the rebars to be connected shall be cold-headed to a specified length and peeled. A metric thread shall be cold-rolled onto the cylindrically peeled lateral surface.

##### 2.2.2 Packaging, transport and storage

The coupling and anchoring elements shall be packed, transported and stored in such a way that they are protected against corrosion, mechanical damage and contamination until they are used at the construction site.

##### 2.2.3 Marking

The coupling and anchoring elements shall be marked where indicated in Annexes 1 to 4 in such a way that the manufacturing plant can be identified.

The manufacturer shall affix the national conformity mark (*Ü-Zeichen*) to the delivery note for the coupling and anchoring elements in accordance with the Conformity Marking Ordinances

(*Übereinstimmungszeichen-Verordnungen*) of the federal states. If the coupling and anchoring elements are manufactured by a supplier, the surveillance reports for these products shall be presented to the manufacturer for the marking. The mark shall only be applied if all requirements for the confirmation of conformity given in Section 2.3 are met.

## 2.3 Confirmation of conformity

### 2.3.1 General

The manufacturer shall confirm for each manufacturing plant that the 'Max Frank Coupler' coupling and anchoring elements comply with the provisions of this decision by way of a declaration of conformity based on factory production control and a certificate of conformity issued by a certification body recognised for these purposes as well as on regular external surveillance carried out by a recognised inspection body in accordance with the following provisions.

To issue the certificate of conformity and for external surveillance, including the associated product testing, the manufacturer of the 'Max Frank Coupler' shall use a certification body as well as an inspection body recognised for these purposes.

The declaration of conformity shall be submitted by the manufacturer through marking of the construction products with the national conformity mark including statement of the intended use.

The certification body shall send a copy of the certificate of conformity issued by it to DIBt.

### 2.3.2 Factory production control

A factory production control system shall be set up and implemented in each manufacturing plant. Factory production control is understood to be continuous surveillance of production by the manufacturer to ensure that the construction products manufactured satisfy the provisions of this decision.

If a manufacturer uses semi-finished products not manufactured in his own manufacturing plant(s) or by a supplier, an appropriate incoming inspection shall be carried out.

The factory production control shall include at least the measures specified in the May 2007 version of the Principles for approval and external surveillance tests of mechanical couplers (*Grundsätze für Zulassungs- und Überwachungsprüfungen von mechanischen Betonstahlverbindungen*).

The geometries of the coupler and rebar threads shall be checked based on a yes/no principle (statistical analysis not required). Samples of the manufactured coupling and anchoring elements shall be taken using statistical criteria to check their external diameters.

For every 1000 manufactured coupling elements of each coupler type or anchorage, one sample in the form of an individual coupling element or an assembled coupler or anchorage shall be checked.

The tensile strength of this coupling element or this coupler or anchorage shall be tested in a tensile test. The sample shall be considered to have passed the test if the assessment criteria set out in the May 2007 version of the Principles for approval and external surveillance tests of mechanical couplers (*Grundsätze für Zulassungs- und Überwachungsprüfungen von mechanischen Betonstahlverbindungen*) are met.

The results of factory production control shall be recorded and evaluated by each manufacturer and each supplier. The records shall include at least the following information:

- designation of the construction product or the starting material and the components



- type of check or test
- date of manufacture and testing of the construction product or the starting material or the components
- results of the checks and tests as well as (if applicable) comparison with requirements
- signature of the person responsible for factory production control.

The records shall be kept for at least five years and submitted to the inspection body used for external surveillance. They shall be submitted to DIBt and the competent supreme building authority upon request.

If the test result is unsatisfactory, the manufacturer or supplier shall immediately take the necessary measures to resolve the defect. Construction products which do not meet the requirements shall be handled in such a way that they cannot be confused with compliant products. After the defect has been remedied, the relevant test shall be repeated immediately – where technically feasible and necessary to show that the defect has been eliminated.

### 2.3.3 External surveillance

At each manufacturing plant, the plant and the factory production control system shall be inspected regularly, i.e. at least twice a year, by means of external surveillance in accordance with the Principles cited in Section 2.3.2.

Initial type-testing of the 'Max Frank Coupler' shall be carried out within the scope of external surveillance. Samples for random testing shall also be taken.

The analysis of the tensile tests in accordance with Section 2.3.2 performed as part of the factory production control shall be double-checked.

The results of certification and external surveillance shall be kept for at least five years. The certification body or inspection body shall present them to DIBt and the competent supreme building authority upon request.

## 3 Provisions for planning, design and execution

### 3.1 Planning and design

#### 3.1.1 Planning

##### 3.1.1.1 General

Unless otherwise specified below, DIN EN 1992-1-1 in conjunction with DIN EN 1992-1-1/NA shall apply to the planning and design.

All rebars may be lapped in one cross section (full lap).

The positions and dimensions of the coupler laps and anchorages shall be marked in the reinforcement drawings. The boundary conditions resulting from the installation instructions shall be met.

##### 3.1.1.2 Concrete cover and bar spacing

The same values as for non-lapped bars shall apply to the concrete cover over the outer edge of a coupler, an anchoring element or a nut as well as to the clear distances between the outer edges of adjacent couplers, anchoring elements and nuts in accordance with DIN EN 1992-1-1 and DIN EN 1992-1-1/NA, Clauses 4.4.1 and 8.2.

The spacing necessary for installation shall remain unaffected.

### 3.1.1.3 Spacing and edge distances of intermediate and end anchorages

The spacing and edge distances given in Annex 5 shall apply. Notwithstanding that, the spacing of the anchorages may be reduced in one direction by up to 15% provided that the minimum required distance of the supplementary reinforcement is maintained and the spacing in the direction perpendicular to that is increased in an identical proportion.

If the anchorages cannot be positioned in one cross-sectional plane, the anchorages shall be offset in the bar direction by at least 1.5 times (for a nominal diameter of 12 to 32 mm) or 2 times (for a nominal diameter of 40 mm) the spacing.

The above provisions shall apply to intermediate and end anchorages.

### 3.1.1.4 Bent bars

For bent (pre-bent) bars, the intentional bending shall not begin until a distance of at least  $5 \cdot \phi$  from the coupling end ( $\phi$  = nominal diameter of the bent bar).

If coupling bars are bent at the manufacturing plant with special equipment, the distance to the coupling end may be reduced to  $2 \cdot \phi$ .

## 3.1.2 Design

### 3.1.2.1 Design for static and quasi-static actions

Couplers and anchorages in accordance with this decision may be loaded up to 100% in the same way as a non-lapped bar under static and quasi-static tensile and compressive load.

### 3.1.2.2 Fatigue

The fatigue verification shall be carried out in accordance with DIN 1992-1-1 and DIN EN 1992-1-1/NA, Clause 6.8.

Depending on the diameter, the following characteristic values for fatigue strength  $\Delta\sigma_{Rsk}$  and stress exponents of the S-N curve shall be assumed:

Nominal diameter [mm]	$\Delta\sigma_{Rsk}$ [N/mm <sup>2</sup> ] for $N = 2 \cdot 10^6$	$k_1 / k_2$ where $N^* = 10^7$
12 to 28	75	3 / 5
32 and 40	65	2.5 / 4

## 3.2 Execution

### 3.2.1 General

The couplers and anchorages shall only be installed by trained staff in accordance with the manufacturer's written work instructions. These installation instructions are part of the accompanying documents.

Only coupling and anchoring elements that are marked in accordance with Section 2.2.3 shall be used.

The required displacement and rotation of the bars must be given.

The threads of the bars, coupling elements and anchoring elements shall be free of rust and contamination.

Only torque tools whose functionality and precision have been tested in accordance with DIN EN ISO 6789-1 shall be used for tightening the screw coupler connections. The torque to be applied is given in Annexes 1 to 4.

### 3.2.2 Inspection at the place of use

The dimensions of the threads on the bar ends shall be inspected randomly with gauges (statistical analysis not required).

The torque wrench shall be checked before and during use to ensure compliance with the requirements given in Section 3.2.1.

The building authority is entitled to take samples from the finished reinforcement if they have reason to believe that it was not executed in compliance with the applicable requirements.

### 3.2.3 Notification of the building authority

The authority supervising the construction or the persons whom it has assigned to supervise the construction shall be notified in advance of the execution of screw couplers or end anchorages.

The following standards and references are referred to in this decision:

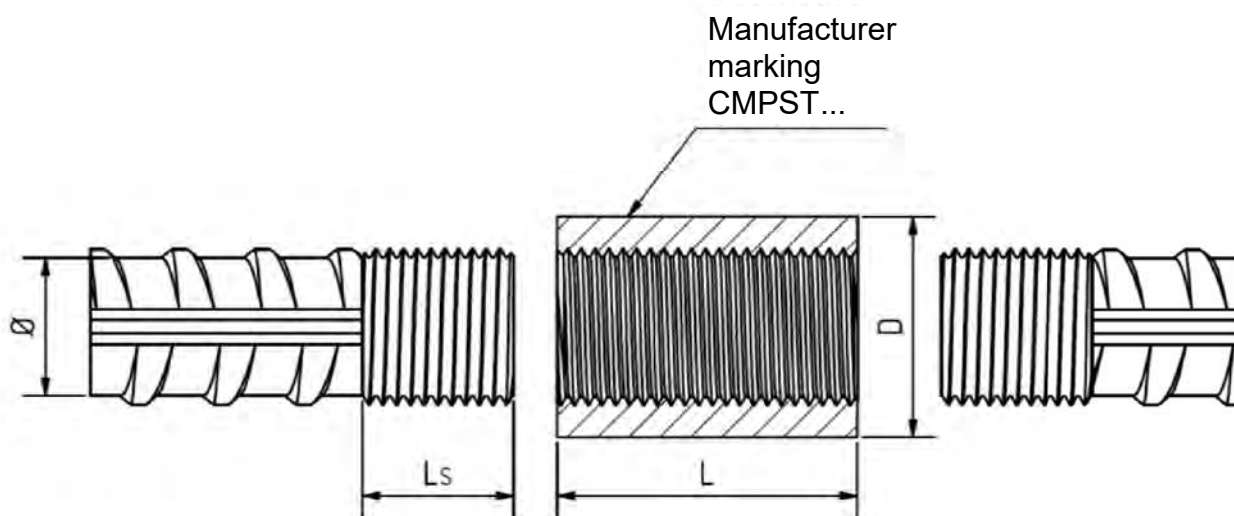
- DIN 488-1:2009-08 Reinforcing steels – Part 1: Grades, properties, marking
- DIN 488-2:2009-08 Reinforcing steels – Reinforcing steel bars
- DIN EN 1992-1-1:2011-01 Eurocode 2: Design of concrete structures – Part 1-1: General rules and rules for buildings; German version EN 1992-1-1:2004+AC:2010 **and**
- DIN EN 1992-1-1/NA:2013-04 National Annex – Nationally determined parameters – Eurocode 2: Design of concrete structures – Part 1-1: General rules and rules for buildings
- DIN EN ISO 6789-1:2017-07 Assembly tools for screws and nuts - Hand torque tools - Part 1: Requirements and method for design conformance testing and quality conformance testing: minimum requirements for declaration of conformance; German version EN ISO 6789-1:2017

Beatrix Wittstock  
Head of Section

Drawn up by

This translation contains a consolidated version of the Annexes to Z-1.5-282, as amended on 26 September 2019

**Max Frank Coupler standard coupler**



Rebar nominal diameter Ø [mm]	Coupler external diameter D [mm]	Coupler length L [mm]	Screw-in depth L <sub>s</sub> [mm]	Thread dimensions [mm]	Torque [Nm]
12	20	28	14	M14.0 X 2.0	40
14	23	32	16	M16.0 X 2.0	80
16	26	36	18	M18.5 X 2.0	120
20	32	44	22	M22.5 X 2.0	180
25	38	54	27	M27.5 X 2.5	270
28	42	60	30	M30.5 X 2.5	270
32	48	68	34	M34.5 X 2.5	300
40	61	85	42.5	M43.5 X 3.0	350

Coupler material: 40Cr in accordance with GB/T 3077  
 1.7035, 1.7039, 1.7225 or 1.7227 in accordance with DIN EN 10083-3

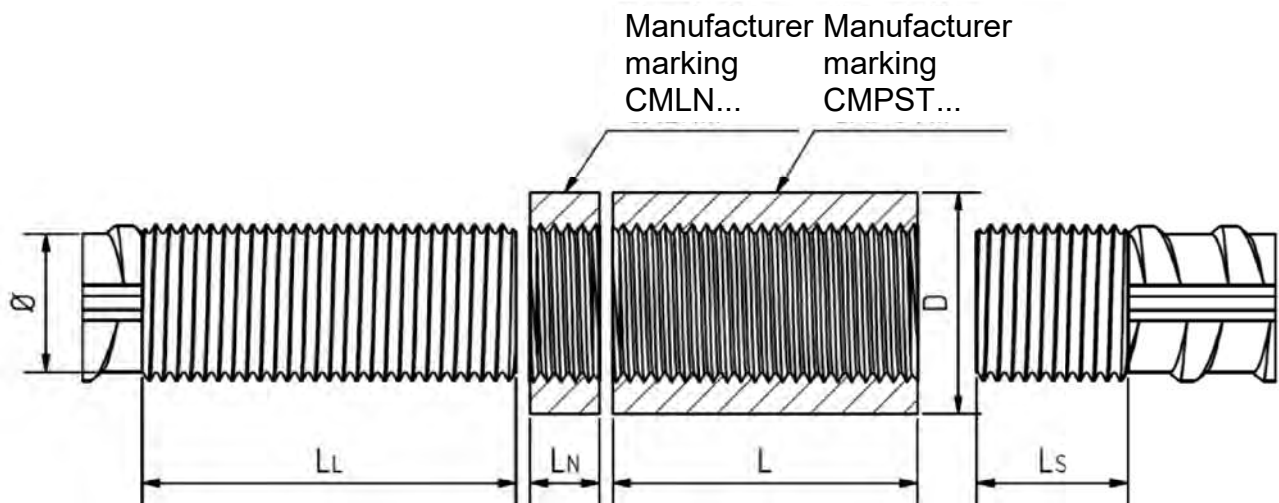
**Mechanical screw couplers and anchorages for reinforcing steel bars  
 'Max Frank Coupler'**

**Standard coupler – rebar nominal diameter 12 to 40 mm**

**Annex 1a**

This translation contains a consolidated version of the Annexes to Z-1.5-282, as amended on 26 September 2019

**Max Frank Coupler positional coupler**



Rebar nominal diameter $\varnothing$	Coupler external diameter D	Coupler length L	Screw-in depth L <sub>s</sub>	Thread length L <sub>L</sub>	Nut length L <sub>N</sub>	Thread dimensions	Torque
[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[Nm]
12	20	28	14	37	9	M14.0 X 2.0	40
14	23	32	16	41	9	M16.0 X 2.0	80
16	26	36	18	45	9	M18.5 X 2.0	120
20	32	44	22	53	9	M22.5 X 2.0	180
25	38	54	27	67	13	M27.5 X 2.5	270
28	42	60	30	73	13	M30.5 X 2.5	270
32	48	68	34	81	13	M34.5 X 2.5	300
40	61	85	42.5	98	13	M43.5 X 3.0	350

Coupler material: 40Cr in accordance with GB/T 3077  
 1.7035, 1.7039, 1.7225 or 1.7227 in accordance with DIN EN 10083-3

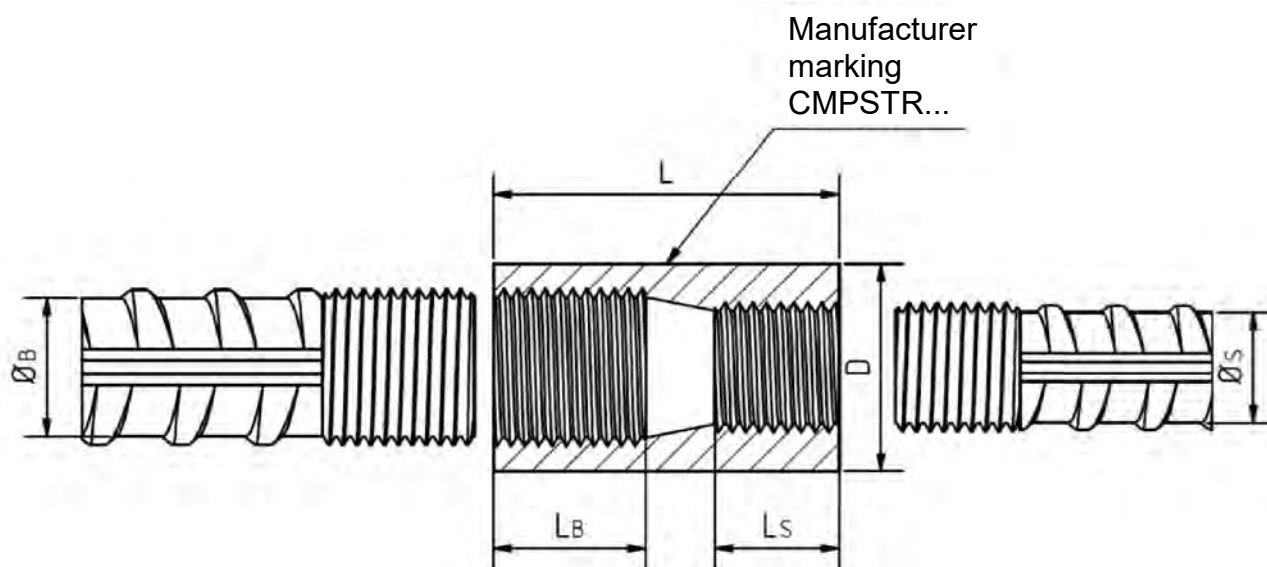
**Mechanical screw couplers and anchorages for reinforcing steel bars  
 'Max Frank Coupler'**

**Positional coupler – rebar nominal diameter 12 to 40 mm**

**Annex 2a**

This translation contains a consolidated version of the Annexes to Z-1.5-282, as amended on 26 September 2019

Max Frank Coupler transition coupler



Rebar nominal diameter $\varnothing_B$ bar B [mm]	Rebar nominal diameter $\varnothing_S$ bar S [mm]	Coupler external diameter D [mm]	Coupler length L [mm]	Screw-in depth $L_B$ [mm]	Screw-in depth $L_S$ [mm]	Thread dimensions bar B [mm]	Thread dimensions bar S [mm]	Torque bar B [Nm]	Torque bar S [Nm]
14	12	23	35	16	14	M16 X 2.0	M14 x 2.0	80	40
16	14	26	39	18	16	M18.5 X 2.0	M16 x 2.0	120	80
20	16	32	45	22	18	M22.5 X 2.0	M18.5 X 2.0	180	120
25	20	38	54	27	22	M27.5 x 2.5	M22.5 X 2.0	270	180
28	25	42	64	30	27	M30.5 x 2.5	M27.5 X 2.5	270	270
28	20	42	59	30	22	M30.5 x 2.5	M22.5 X 2.0	270	180
32	28	48	71	34	30	M34.5 x 2.5	M30.5 X 2.5	300	270
32	25	48	68	34	27	M34.5 x 2.5	M27.5 X 2.5	300	270
40	32	61	84	43	34	M43.5 x 3.0	M34.5 X 2.5	350	300
40	28	61	80	43	30	M43.5 X 3.0	M30.5 X 2.5	350	270

Coupler material: 40Cr in accordance with GB/T 3077  
 1.7035, 1.7039, 1.7225 or 1.7227 in accordance with DIN EN 10083-3

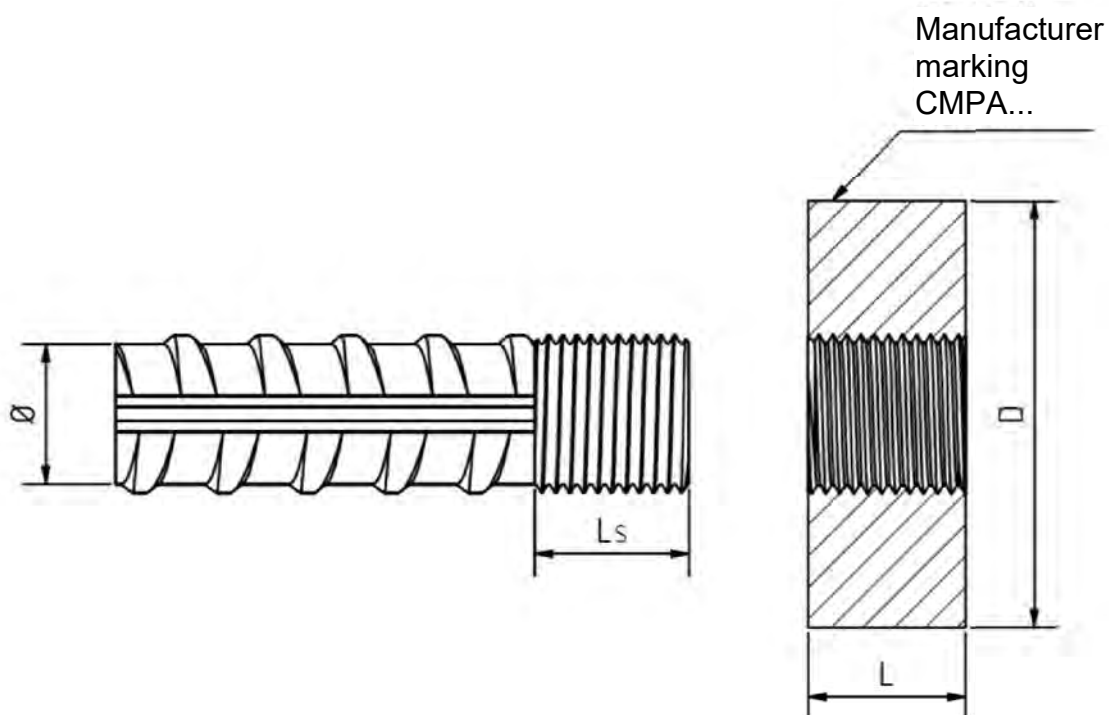
**Mechanical screw couplers and anchorages for reinforcing steel bars  
 'Max Frank Coupler'**

**Transition coupler – rebar nominal diameter 12 to 40 mm**

**Annex 3a**

This translation contains a consolidated version of the Annexes to Z-1.5-282, as amended on 26 September 2019

### Max Frank Coupler end anchor



Rebar nominal diameter Ø [mm]	External diameter D [mm]	Anchor length L [mm]	Screw-in depth Ls [mm]	Thread dimensions [mm]	Torque [Nm]
12	45	14	14	M14.0 X 2.0	40
14	45	16	16	M16.0 X 2.0	80
16	55	18	18	M18.5 X 2.0	120
20	65	22	22	M22.5 X 2.0	180
25	80	27	27	M27.5 X 2.5	270
28	95	30	30	M30.5 X 2.5	270
32	105	34	34	M34.5 X 2.5	300
40	130	42.5	42.5	M43.5 X 3.0	350

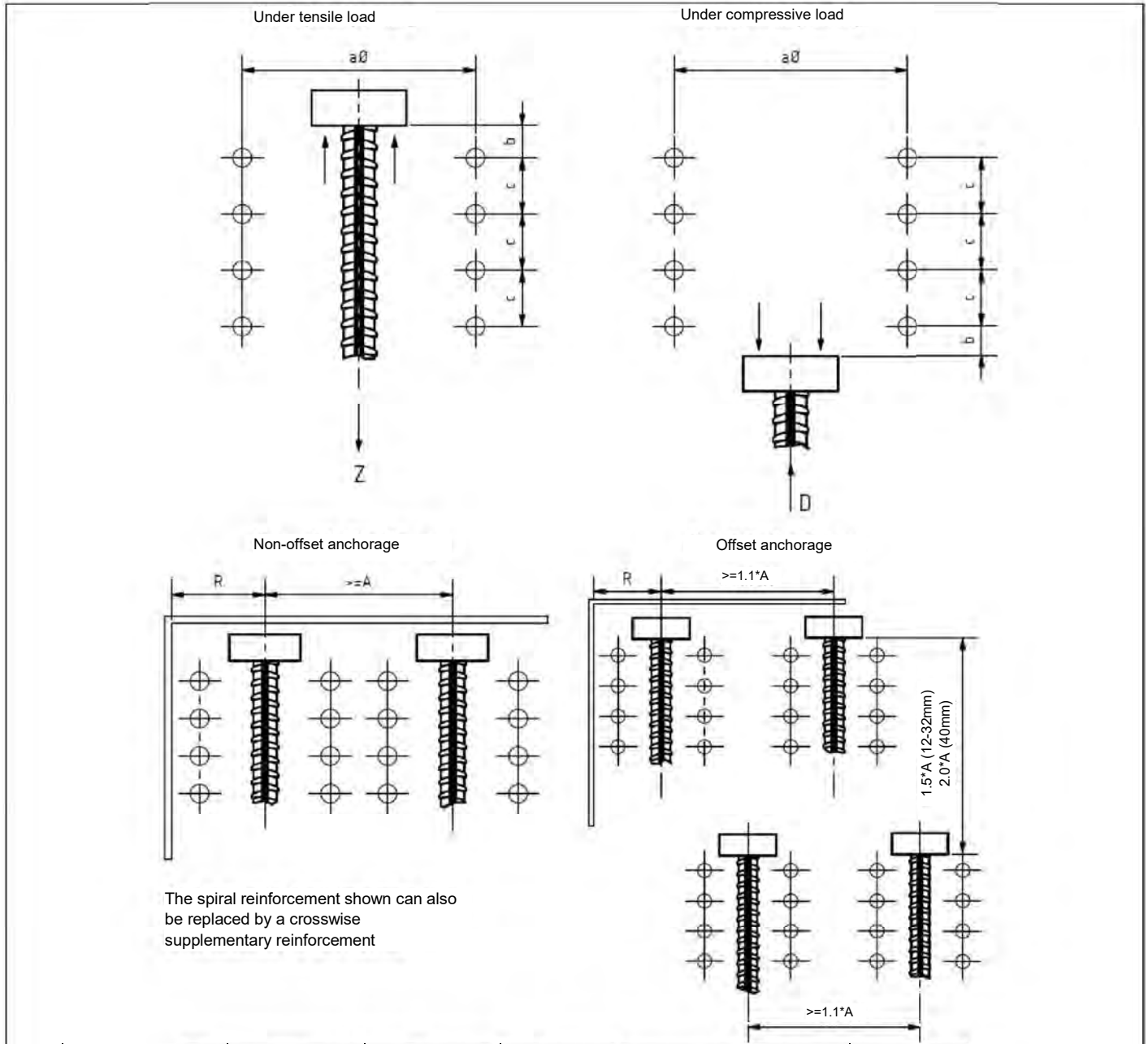
Coupler material: 40Cr in accordance with GB/T 3077, C45  
 1.7035, 1.7039, 1.7225 or 1.7227 in accordance with DIN EN 10083-3

**Mechanical screw couplers and anchorages for reinforcing steel bars  
 'Max Frank Coupler'**

**End anchor – rebar nominal diameter 12 to 40 mm**

**Annex 4a**

This translation contains a consolidated version of the Annexes to Z-1.5-282, as amended on 26 September 2019



Rebar nominal diameter [mm]	Spacing A [mm]	Edge distance R [mm]	Supplementary reinforcement				
			Number n [-]	$\varnothing_{sup}$ [mm]	a [mm]	b [mm]	c [mm]
12	85	65	3	6	60	20	28
14	85	65	3	6	60	20	28
16	100	70	3	6	70	20	30
20	130	85	4	6	100	20	32
25	145	90	4	6	120	15	41
28	170	100	3	8	140	10	41
32	190	110	3	8	155	20	50
40	250	150	3	10	200	25	45

Mechanical screw couplers and anchorages for reinforcing steel bars  
 'Max Frank Coupler'

Distances and supplementary reinforcement for end anchorage

Annex 5