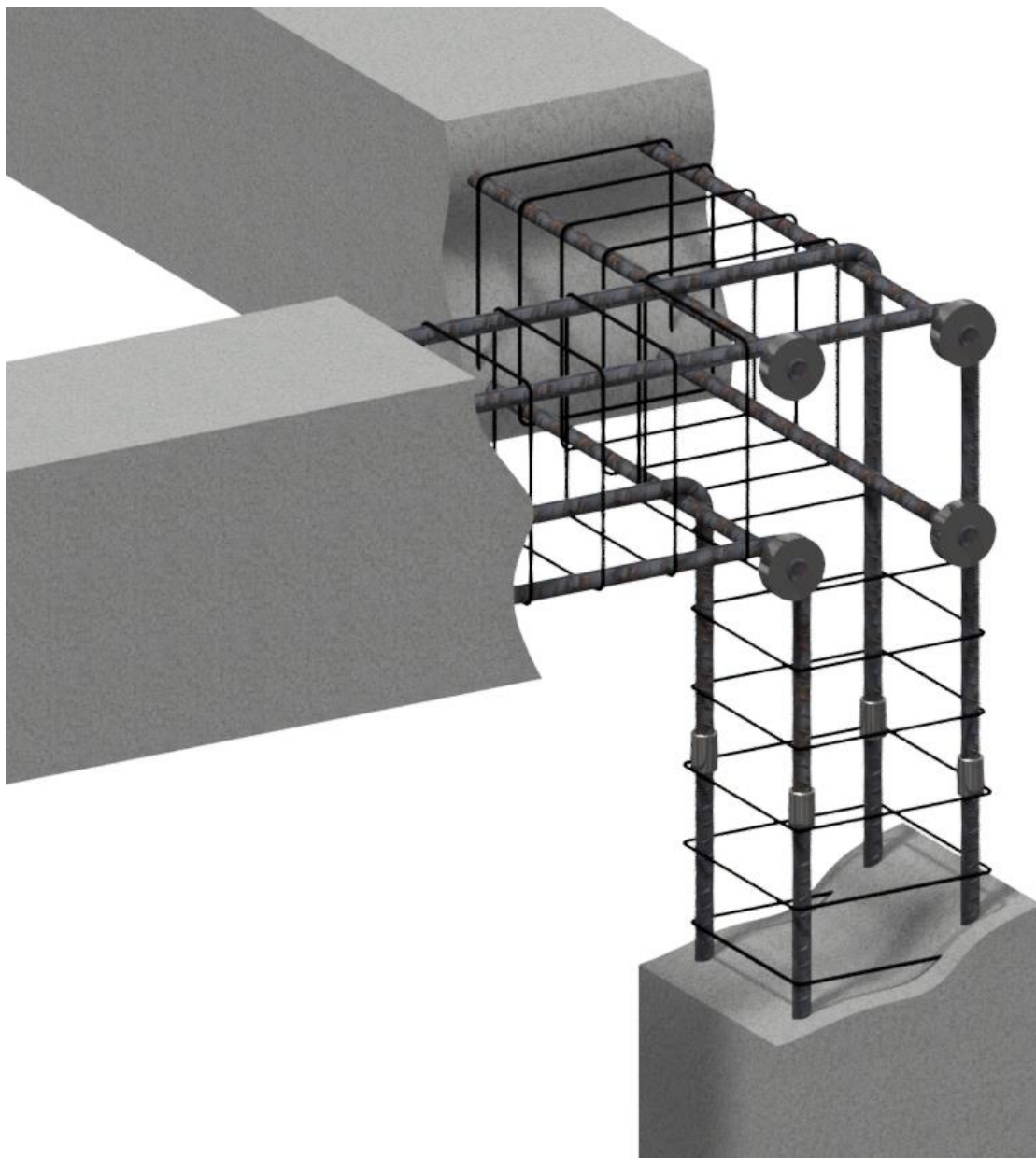


TECHNICAL DOCUMENTATION



REINFORCEMENT SYSTEMS | ON SITE SOLUTIONS **COLD FORGED REBAR CONNECTION SYSTEM**



OVERVIEW

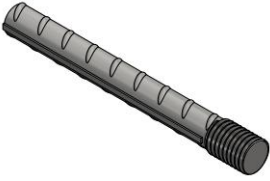
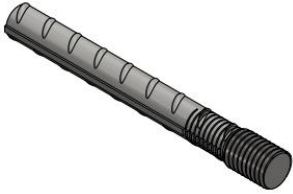

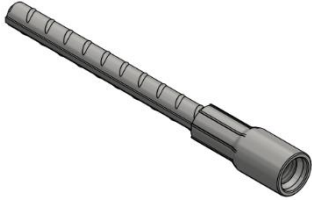
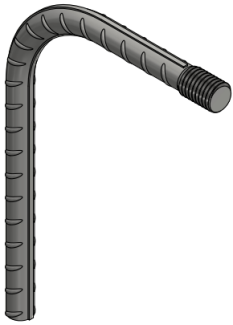



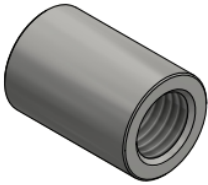






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INTRODUCTION

Terwa rebar connection system is a high-quality, economical reinforcement connection system. The rebar connection system is a simple, efficient method for connecting reinforcement bars, which eliminates the disadvantages of the traditional method for overlapping joints. Overlapping joints are time-consuming, cause greater congestion of rebar and are not safe to use in seismic areas. The couplers design allows a connection of the reinforcement steel in which the characteristics are equivalent to the uninterrupted reinforcing bar. In addition, the loads are transferred in the bar, not in concrete as in the overlapped joints. Impact damage or a seismic event only affects the concrete and the rebar connections retain their strength. Terwa threaded couplers allow easy installation of the reinforcements both on site and in the prefab factory using standard tools.

Functional Advantages

- **Tensile Load Capacity:** Terwa cold forged coupler's design ensures that the threaded connection can handle significant tensile loads, crucial for maintaining structural integrity in reinforced concrete structures.
- **Shear Load Capacity:** The increased thread strength also enhances the coupler's ability to resist shear loads, which are forces that cause parts of a material to slide past one another.
- **Ease of Installation:** The metric threading allows for easy and quick installation on-site, reducing labour time and costs.

Applications:

The TFS reinforcement coupler is used in various construction projects, including:

- **Concrete Structures:** Bridges, buildings, tunnels and other infrastructure where reinforced concrete is used.
- **Seismic Zones:** Areas prone to earthquakes, where strong and reliable connections between rebars are essential to withstand seismic forces.
- **High-Load Areas:** Sections of structures subjected to high tensile and shear forces, such as columns, beams, and load-bearing walls.

Installation:

- A nut wrench is not required for tightening the coupling. A pipe wrench or torque wrench has to be used to tighten the couplers and prevent thread movement.
- Special tools, power sources and special training of personnel are not required.
- The metric thread connection method allows for fast, easy control of the connection.
- Mounting time is reduced to a minimum.

Terwa rebar connection system consists of:

- Reinforcement steel:
 - B500A, B500B according to NEN 6008
 - B450C, B500A, B500B, B500C according to EN 10080.
 - B500B, B500C according to BS4449.
 - B500A, B500B, B500C according to DIN 488
 - B500A, B500B, B500C according to NF A35-080-1
 - B500A, B500B, B500C according to SFS 1300
 - K500B-T, K500C-T according to SS-EN 10080+SS 212540
 - B500NC according to NS-EN 10080+NS 3576
 - B550B according to EN 10080 and ÖN 4707
- Cold forged and threaded reinforcement bar – TFS, TFS-E, TFSG, TFSG-E coupler.
- Fixing connectors KB-F, KB-F-T.
- Welding coupler KB-F-W.
- Accessories.

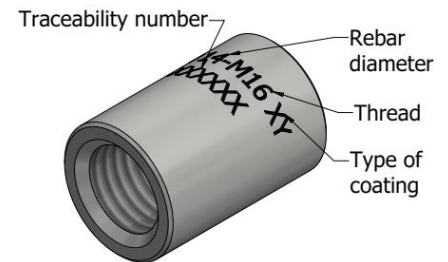
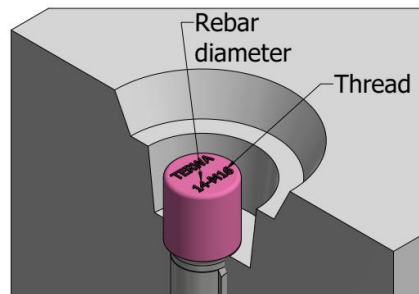
Quality

Terwa continuously controls the coupler production process in terms of strength, dimensional and material quality. It also performs all the required inspections to ensure a high-quality system. All the products are tracked from material acquisition to the final, ready-to-use stage.



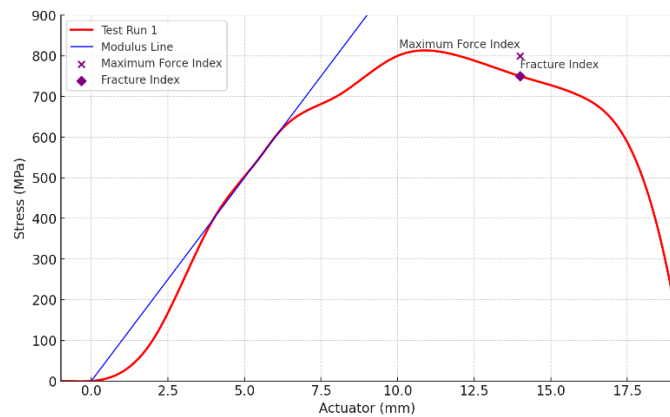
Marking and traceability

All systems have all data necessary for traceability, rebar dimension and thread type.



Coupler testing

Terwa rebar couplers are designed to ensure the full transfer of the load to the reinforcement steel and a slip value under 0.1 mm. Terwa periodically tests the system for this in the factory according to European standards.



Sustainability

The sustainability advantages of the rebar connection system are multifaceted, encompassing resource efficiency, reduced environmental impact, enhanced durability, flexibility in design, improved health and safety and alignment with sustainability standards. By integrating Terwa couplers into construction practices, the industry can significantly contribute to environmental conservation and the development of sustainable infrastructure.

- **Lower Carbon Footprint:** Cold forging and cut threading processes consume less energy compared to traditional welding methods, leading to a reduction in greenhouse gas emissions. Cold forging is performed at room temperature, eliminating the need for energy-intensive heating processes.
- **Minimal Waste:** The precision of the connection system minimises material waste, which reduces the amount of scrap rebar that needs to be recycled or disposed of, thus lowering the environmental impact.

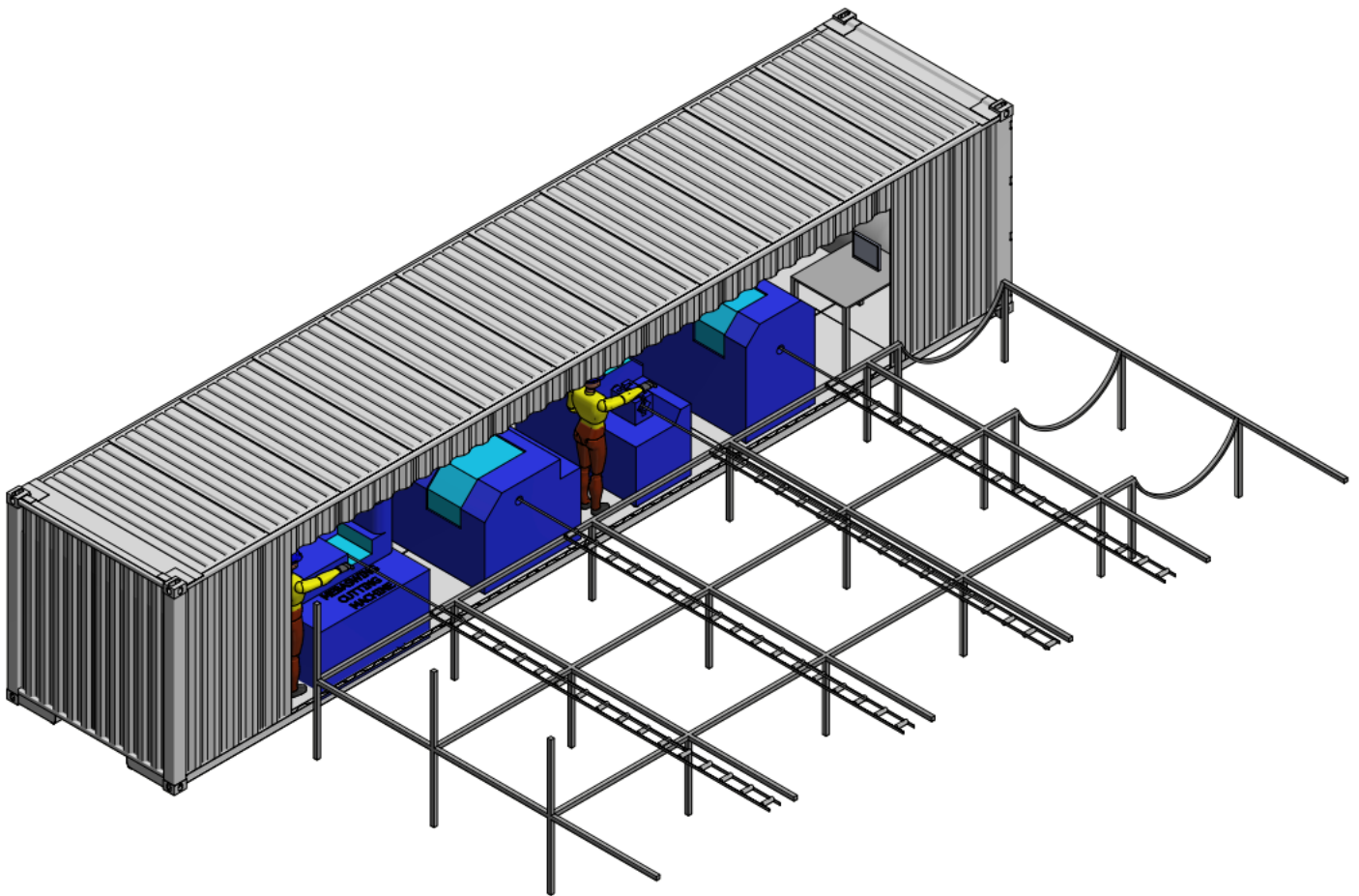
COLD FORGED REINFORCEMENT COUPLER – PRODUCTION PROCESS

The Terwa cold forged connection system involves specialised equipment and materials used in construction and engineering, specifically for creating strong, reliable connections between structural elements.

By providing a complete, containerised solution, Terwa ensures that all necessary components for the cold forged connection system are available and easily transportable, streamlining the installation process and maintaining high quality and safety standards.

Containerised Delivery:

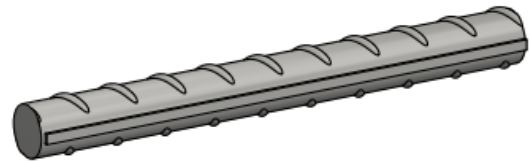
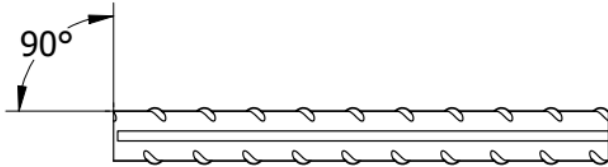
All the necessary equipment for the Terwa cold forged connection system is compact enough to be shipped in a single container, typically a standard ISO container. This indicates a high level of organisation and efficiency in packaging and logistics, allowing for easier transport and on-site management.



Production phases consist of the following operations:

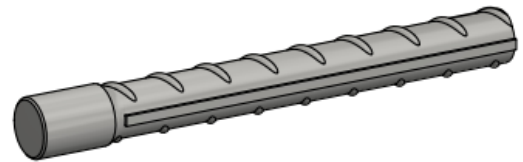
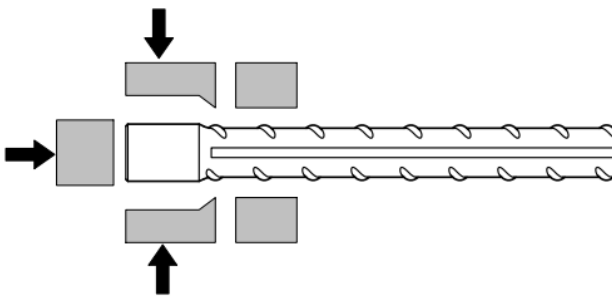
1. Cutting

The rebar end is cut square with a band saw.



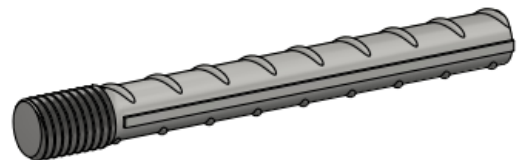
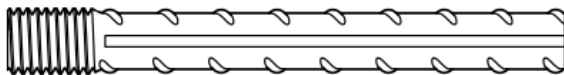
2. Cold forging

The sawn end of rebar is then enlarged by cold pressing



3. Threading

The enlarged end of the rebar is threaded by cutting



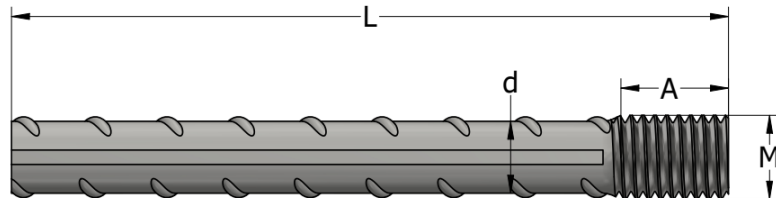
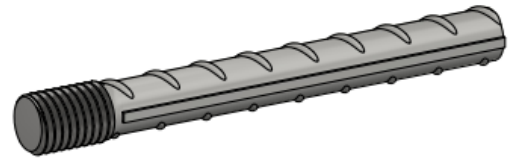
4. Thread stress release.

Stress release is applied to the thread. At the same time, the mark for traceability is made



COLD FORGED REINFORCEMENT COUPLER TFS

The reinforcement coupler TFS can be made of various types of reinforcement steel (page 4), cold forged at one end and then cut threaded with metric thread. The end diameter is enlarged more than the rebar diameter to increase the strength of the thread for tensile and shear loads.

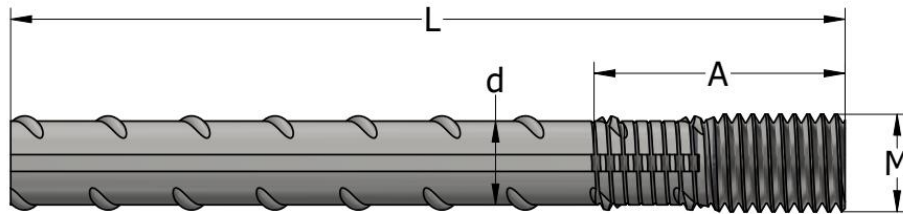


TFS Product description	Product number	Rebar diameter d [mm]	Thread dimensions	
			Metric	A [mm]
TFS 12 – M14 - L	91815	12	M14 x 2	14
TFS 14 – M16 - L	91841	14	M16 x 2	16
TFS 16 - M20 - L	91816	16	M20 x 2.5	20
TFS 18 - M22 - L	91817	18	M22 x 2.5	22
TFS 20 - M24 - L	91818	20	M24 x 3	24
TFS 22 - M27 - L	91819	22	M27 x 3	27
TFS 25 - M30 - L	91820	25	M30 x 3.5	30
TFS 28 – M33 - L	91821	28	M33 x 3.5	33
TFS 32 – M36 - L	91822	32	M36 x 4	36
TFS 36 – M42 - L	91823	36	M42 x 4.5	42
TFS 40 - M45 - L	91824	40	M45 x 4.5	45

Other lengths are available on request: **TFS– diam. d – thread x length (L) in mm.**

COLD FORGED REINFORCEMENT COUPLER TFS-E

The reinforcement coupler TFS-E can be made of various types of reinforcement steel (page 4), cold forged at one end and then cut threaded with a metric thread. The end diameter is enlarged more than the rebar diameter to increase the strength of the thread for tensile and shear loads. The threading of the forged end bar is extended to allow the use of a lock nut. These TFS-E couplers are used for bent bars that need to be fixed in a certain position or bars that are not allowed to rotate.

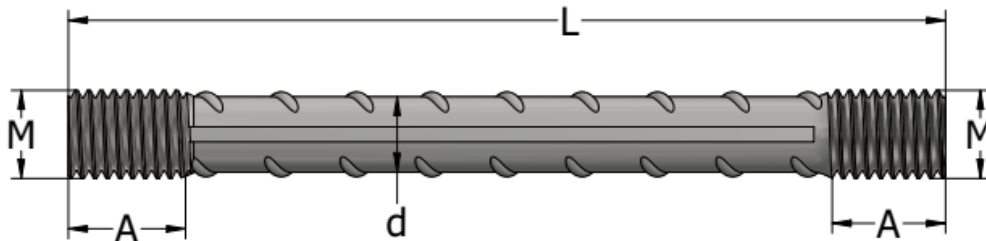
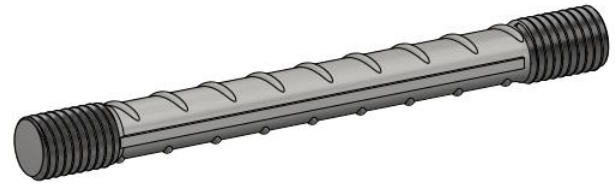


TFS-E Product description	Product number	Rebar diameter d	Thread dimensions	
		[mm]	Metric	A [mm]
TFS-E 12 – M14 - L	91929	12	M14 x 2	38
TFS-E 14 – M16 - L	91930	14	M16 x 2	42
TFS-E 16 - M20 - L	91931	16	M20 x 2.5	52
TFS-E 18 - M22 - L	91932	18	M22 x 2.5	56
TFS-E 20 - M24 - L	91933	20	M24 x 3	60
TFS-E 22 - M27 - L	91934	22	M27 x 3	69
TFS-E 25 - M30 - L	91935	25	M30 x 3.5	75
TFS-E 28 – M33 - L	91936	28	M33 x 3.5	81
TFS-E 32 – M36 - L	91937	32	M36 x 4	87
TFS-E 36 – M42 - L	91938	36	M42 x 4.5	104
TFS-E 40 - M45 - L	91939	40	M45 x 4.5	110

Other lengths are available on request **TFS-E – diam. d – thread x length (L) in mm.**

COLD FORGED REINFORCEMENT COUPLER TFSD

The reinforcement coupler TFSD can be made of various types of reinforcement steel (page 4), cold forged at both ends and then cut threaded with metric thread. The ends diameter is enlarged more than the rebar diameter to increase the strength of the thread for tensile and shear loads.

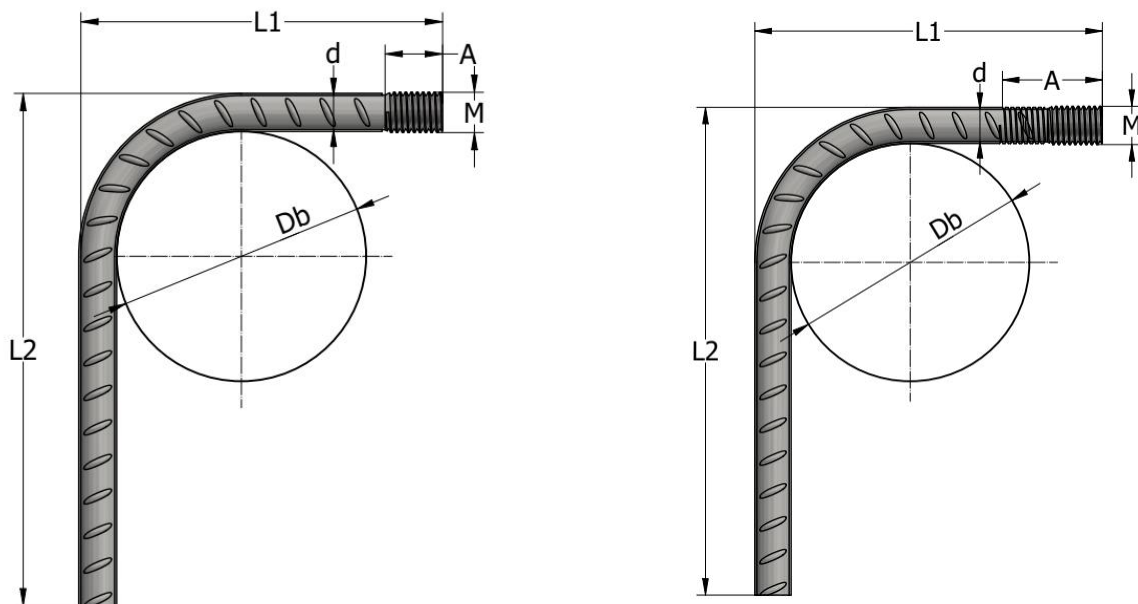


TFSD Product description	Product number	Rebar diameter d	Thread dimensions	
		[mm]	Metric	A [mm]
TFSD 12 – M14 - L	91953	12	M14 x 2	14
TFSD14 – M16 - L	91954	14	M16 x 2	16
TFSD 16 - M20 - L	91955	16	M20 x 2.5	20
TFSD 18 - M22 - L	91956	18	M22 x 2.5	22
TFSD 20 - M24 - L	91957	20	M24 x 3	24
TFSD 22 - M27 - L	91958	22	M27 x 3	27
TFSD 25 - M30 - L	91959	25	M30 x 3.5	30
TFSD 28 – M33 - L	91960	28	M33 x 3.5	33
TFSD 32 – M36 - L	91961	32	M36 x 4	36
TFSD 36 – M42 - L	91962	36	M42 x 4.5	42
TFSD 40 - M45 - L	91963	40	M45 x 4.5	45

Other lengths are available on request **TFSD – diam. d – thread x length (L) in mm.**

COLD FORGED BENT REINFORCEMENT COUPLER TFSG AND TFSG-E

The TFSG reinforcement coupler consists of a bent TFS reinforcement coupler.



TFSG	Rebar diameter	Thread	
	d [mm]	Metric [mm]	A [mm]
TFSG 12 – M14 - L	12	M14 x 2	14
TFSG 14 – M16 - L	14	M16 x 2	16
TFSG 16 – M20 - L	16	M20 x 2.5	20
TFSG 18 – M22 - L	18	M22 x 2.5	22
TFSG 20 – M24 - L	20	M24 x 3	24
TFSG 22 – M27 - L	22	M27 x 3	27
TFSG 25 – M30 - L	25	M30 x 3.5	30
TFSG 28 – M33 - L	28	M33 x 3.5	33
TFSG 32 – M36 - L	32	M36 x 4	36
TFSG 36 – M42 - L	36	M42 x 4.5	42
TFSG 40 – M45 - L	40	M45 x 4.5	45

TFSG-E	Rebar diameter	Thread	
	d [mm]	Metric [mm]	A [mm]
TFSG-E 12 – M14 - L	12	M14 x 2	35
TFSG-E 14 – M16 - L	14	M16 x 2	40
TFSG-E 16 – M20 - L	16	M20 x 2.5	50
TFSG-E 18 – M22 - L	18	M22 x 2.5	55
TFSG-E 20 – M24 - L	20	M24 x 3	60
TFSG-E 22 – M27 - L	22	M27 x 3	67.5
TFSG-E 25 – M30 - L	25	M30 x 3.5	75
TFSG-E 28 – M33 - L	28	M33 x 3.5	82.5
TFSG-E 32 – M36 - L	32	M36 x 4	90
TFSG-E 36 – M42 - L	36	M42 x 4.5	105
TFSG-E 40 – M45 - L	40	M45 x 4.5	112.5

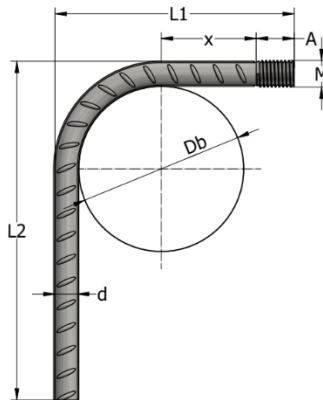
The TFSG and TFSG-E coupler generally has a bent diameter $Db = 10 \times d$, but on request, it can be manufactured at $Db = 15 \times d$ or $Db = 20 \times d$. They can be produced in different L_1 and L_2 sizes. When choosing dimensions L_1 and L_2 , the minimum size according to the table below should be considered. L_1 is the length measured from the front to the back of the reinforcing bar.

Order example **TFSG – d – thread - length $L_1 \times L_2$ in mm.**

The minimum dimensions for bending are indicated in the following table. The diameter to which a bar is bent should be such that damage to the reinforcement and crushing of concrete inside the bend of the bar are avoided. According to Eurocode 2 (EN 1992-1-1), the minimum bend diameter should be:

- $Db_{min} = 4 \times d$ for bar diameter $d \leq 16\text{mm}$
- $Db_{min} = 7 \times d$ for bar diameter $d > 16\text{mm}$

Minimum dimensions of bent reinforcement TFSG couplers



Rebar diameter d	12	14	16	18	20	22	25	28	32	36	40
A	14	16	20	22	24	27	30	33	36	42	45
Bend diameter D_{bmin}	4xd	4xd	4xd	7xd	7xd	7xd	7xd	7xd	7xd	7xd	7xd
	48	56	64	126	140	154	175	196	224	252	280
$x_{min} = 5xd$ acc. to Eurocode 2	60	70	80	90	100	110	125	140	160	180	200
L_1 minim	110	130	150	195	215	240	270	300	340	385	425
On request, the bends can also be made at the dimensions below											
$x_{min} = 2xd$	24	28	32	36	40	44	50	56	64	72	80
L_1 minim	75	90	100	140	155	170	195	215	245	280	305

The length for the bent reinforcement coupler can be calculated using the formula:

$$L = L_1 + L_2 - a, \quad \text{for a single bend}$$

$$L = L_1 + L_2 + L_1 - 2a \quad \text{for double bends}$$

$$a = (D_b + 2d) - b \quad \text{"b" is the length in the bending area, "a" reduction of the bar length due to bending}$$

"a" reduction of bar length due to bending	Reinforcing bar diameter d (mm)										
	12	14	16	18	20	22	25	28	32	40	
Bend diameter D_b mm	4 x d	25	29	33	-	-	-	-	-	-	
	7 x d	33	38	44	49	54	60	68	76	87	109
	10 x d	40	47	54	61	67	74	84	94	108	135
	15 x d	53	62	71	80	89	98	111	124	142	178
	20 x d	66	77	88	99	110	121	138	154	176	221

FIXING CONNECTOR– KB-F STANDARD

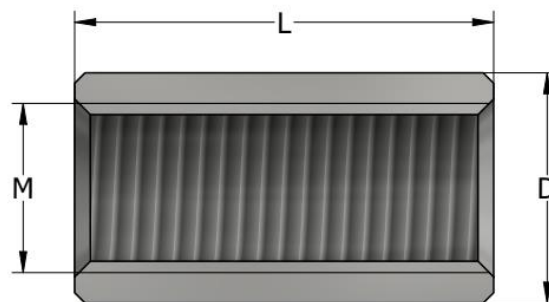
The KB-F connectors are the smallest couplers in the Terwa product range. They ensure a maximum resistance connection.

KB-F connectors are used to couple TFS cold forged rebars and for steel rebars with a diameter between 12mm and 40mm.

The KB-F connector consists of a fully threaded bushing with a single right-hand thread. Connectors are tested for certification and manufactured in accordance with technical standards.

This is the perfect solution for connecting two reinforcing bars when it is possible to rotate and axially move the second bar.

KB-F connectors are made of quality non-alloy steel, electrolytically galvanised (EV) in the standard version. They can also be produced without anti-corrosion protection.

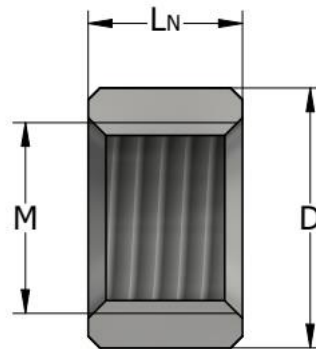


KB-F standard	Product number		Rebar diameter d	Metric	Length L	D
	Electrolytic galvanised EV	Black	[mm]	M	[mm]	[mm]
KB-F M14	67979	68685	12	M14 x 2	28	20
KB-F M16	68137	68686	14	M16 x 2	32	22
KB-F M20	67305	68687	16	M20 x 2.5	40	27
KB-F M22	67972	68688	18	M22 x 2.5	44	30
KB-F M24	67306	68689	20	M24 x 3	48	33
KB-F M27	67973	68690	22	M27 x 3	54	36
KB-F M30	67307	68691	25	M30 x 3.5	60	40
KB-F M33	67974	68692	28	M33 x 3.5	66	45
KB-F M36	67308	68693	32	M36 x 4	72	50
KB-F M42	67975	68694	36	M42 x 4.5	84	58
KB-F M45	67309	68695	40	M45 x 4.5	90	62

LOCK NUT

The lock nut together with the KB-F connector ensures the perfect connection of two reinforcing bars when only the axial movement of the second bar is possible, but its rotation is not possible.

The lock nut in the standard version is electrolytically galvanised (EV). They can also be produced without anti-corrosion protection.

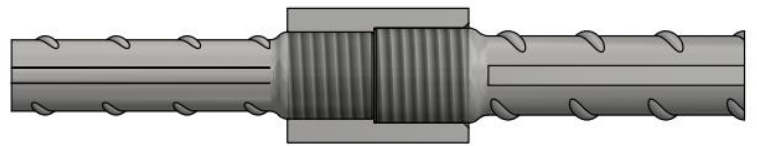
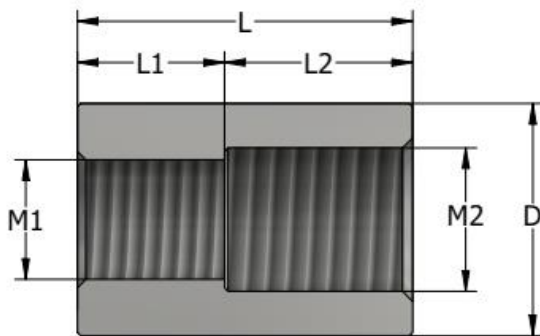


Lock nut	Product number		Rebar diameter d	Metric	Length L_N	D
	Electrolytic galvanised EV	Black	[mm]	M	[mm]	[mm]
LN M14	69524	69535	12	M14 x 2	10	20
LN M16	69525	69536	14	M16 x 2	10	22
LN M20	69526	69537	16	M20 x 2.5	12	27
LN M22	69527	69538	18	M22 x 2.5	12	30
LN M24	69528	69539	20	M24 x 3	12	33
LN M27	69529	69540	22	M27 x 3	15	36
LN M30	69530	69541	25	M30 x 3.5	15	40
LN M33	69531	69542	28	M33 x 3.5	15	45
LN M36	69532	69543	32	M36 x 4	15	50
LN M42	69533	69544	36	M42 x 4.5	20	58
LN M45	69534	69545	40	M45 x 4.5	20	62

TRANSITION CONNECTOR – KB-F T

KB-F T transition connectors are used to connect rebars of different diameters. These connectors ensure the full tensile strength of smaller diameter rebars.

This is the perfect solution for connecting two reinforcing bars when it is possible to rotate and axially move the second bar. The KB-F T connectors are made of quality non-alloy steel, electrolytically galvanised (EV) in the standard version. They can also be produced without anti-corrosion protection.



KB-F T	Product number		Rebar diameter	Metric	Metric	Length	Length	Length L	D
	Electrolytic galvanised EV	Black	Ø	M1	M2	L1	L2	[mm]	[mm]
KB-F-T M14/M16	68138	69504	12-14	14 x 2	16 x 2	14	16	30	22
KB-F-T M16/M20	68139	69505	14-16	16 x 2	20 x 2.5	16	20	36	27
KB-F-T M20/M22	67987	69506	16-18	20 x 2.5	22 x 2.5	20	22	42	30
KB-F-T M22/M24	67988	69507	18-20	22 x 2.5	24 x 3	22	24	46	32
KB-F-T M24/M27	67989	69508	20-22	24 x 3	27 x 3	24	27	51	36
KB-F-T M27/M30	67990	69509	22-25	27 x 3	30 x 3.5	27	30	57	40
KB-F-T M30/M33	67991	69510	25-28	30 x 3.5	33 x 3.5	30	33	63	45
KB-F-T M33/M36	67992	69512	28-32	33 x 3.5	36 x 4	33	36	69	50
KB-F-T M36/M42	67993	69513	32-36	36 x 4	42 x 4.5	36	42	78	58
KB-F-T M42/M45	67994	69514	36-40	42 x 4.5	45 x 4.5	42	45	87	62

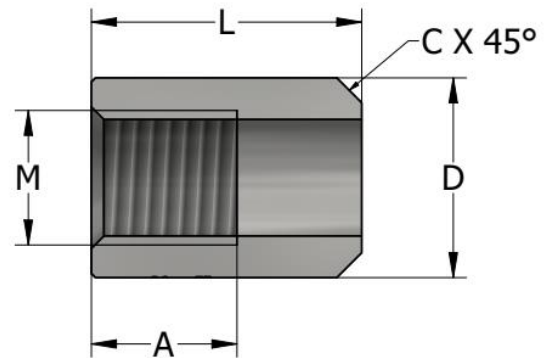
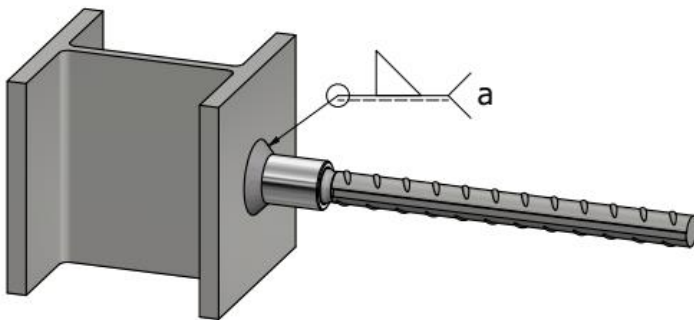
Note:

Depending on the project, KB-F T connectors can be produced with other dimensions (diameter changes) than those shown in the table above.

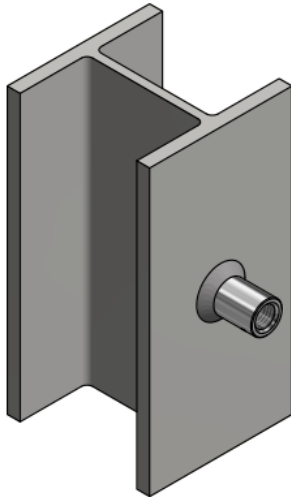
KB-F-W WELDABLE CONNECTOR

KB-F-W couplers are used to connect reinforcing bars to structural steel (S275 or S355 grade) plates or sections. The KB-W sleeve has a thread at one end and the other end is welded directly to the steel structure. The KB-F-W couplers are made of steel C45 or its equivalent. The designer must specify the type and size of weld ("a"). Welders should be qualified for the required weld type.

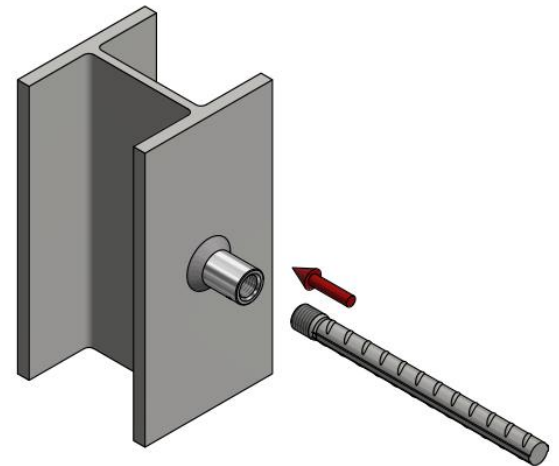
The CEV (carbon equivalent value) for KB-F-W varies between 0.50 and 0.75.



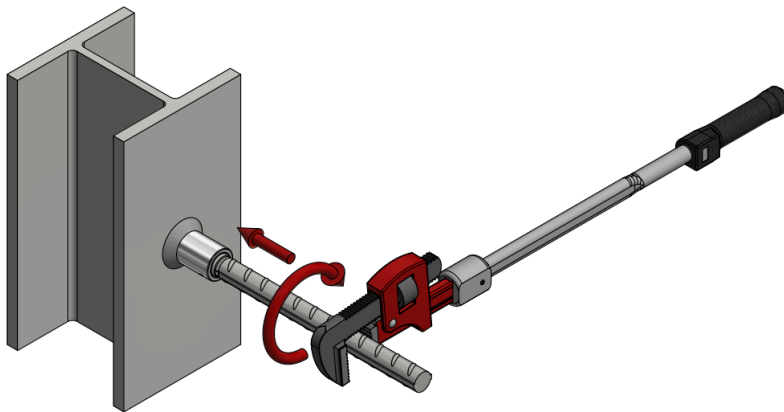
KB-F-W	Product number	Rebar diameter	Metric	Length L	D	A	C
		d [mm]	M	[mm]	[mm]	[mm]	[mm]
KB-F-W-12-M14	69586	12	M14 x 2	30.5	20	15.5	2.5
KB-F-W-14-M16	69587	14	M16 x 2	32.5	22	17.5	2.5
KB-F-W-16-M20	69588	16	M20 x 2.5	37	27	22	3.0
KB-F-W-18-M22	69589	18	M22 x 2.5	41	30	24	3.0
KB-F-W-20-M24	69590	20	M24 x 3	46	33	26	3.5
KB-F-W-22-M27	69591	22	M27 x 3	49	36	29	3.5
KB-F-W-25-M30	69592	25	M30 x 3.5	53	40	33	4.0
KB-F-W-28-M33	69593	28	M33 x 3.5	56	45	36	4.5
KB-F-W-32-M36	69594	32	M36 x 4	59	50	39	5.0
KB-F-W-36-M42	69595	36	M42 x 4.5	65	58	45	6.0
KB-F-W-40-M45	69596	40	M45 x 4.5	68	62	48	6.5



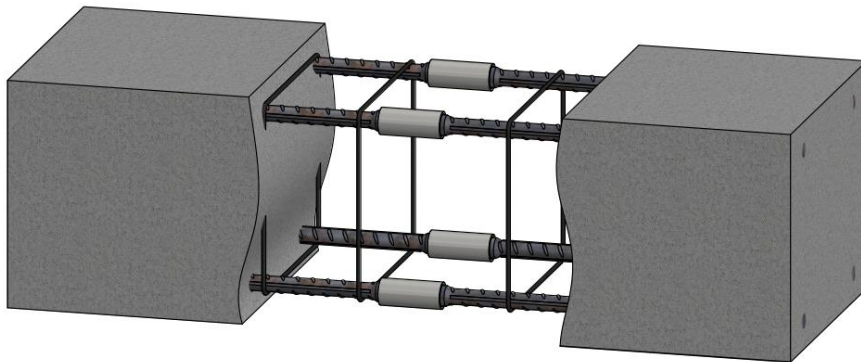
Weld the KB-F-W to the steel structure.



Position the TFS coupler in the KB-F-W.



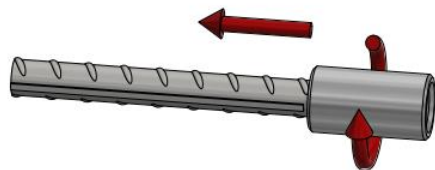
Rotate the TFS bar in the KB-F-W coupler until it is tight. To ensure the quality of connection, tighten the TFS bar with a torque wrench. The necessary torque for each type of rebar is indicated in the table on page 28.

COUPLING INSTRUCTIONS FOR COLD FORGED REINFORCING BARS USING KB-F AND KB-F T CONNECTORS

Standard connection

- *The first bar cannot be moved axially or rotated.*
- *The second bar can be moved axially and rotated.*



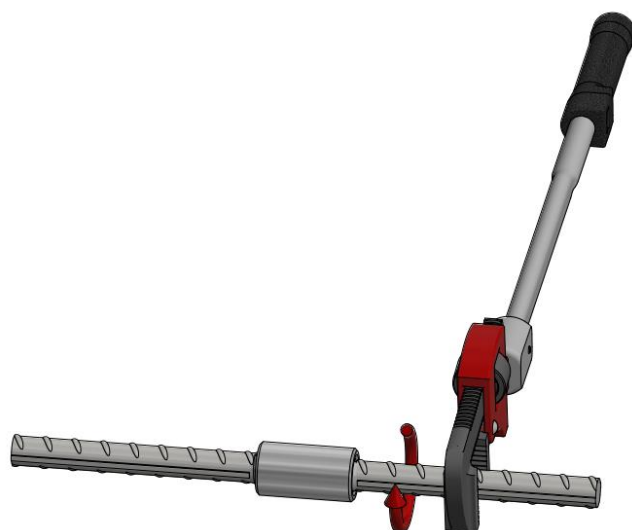
The first cold forged TFS rebar coupler is fixed.



Screw the KB-F or KB-F T onto the TFS.



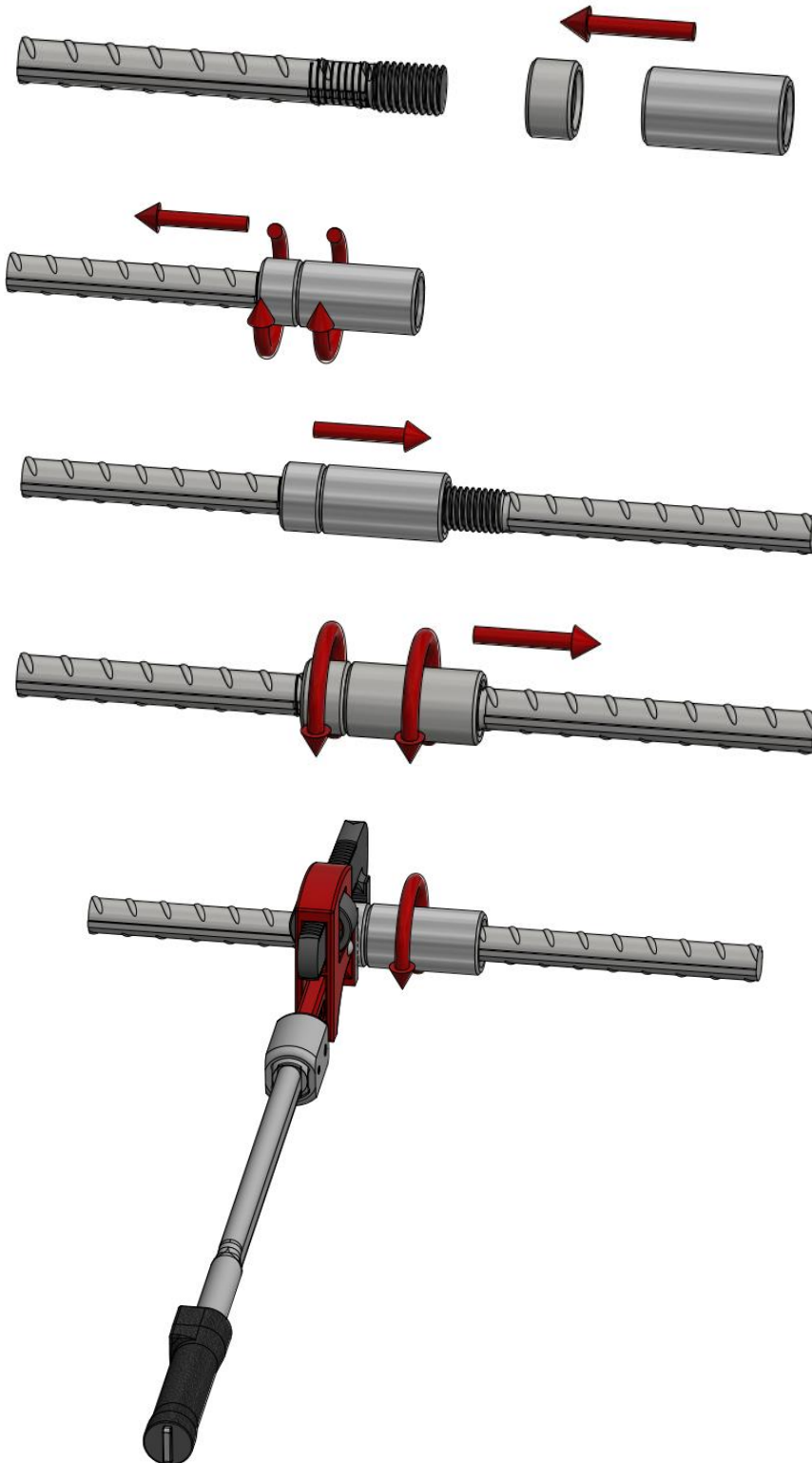
Screw the second TFS rebar coupler in the KB-F or KB-F T.



Tighten the connection using a torque wrench on the second TFS rebar coupler. The necessary torque for each type of rebar is indicated in the table on page 28.

Positioning connection

- *The first bar can be moved axially or rotated.*
- *The second bar cannot be moved axially or rotated.*



Screw a lock nut and a KB-F connector onto the TFS-E.

Bring the first connecting bar, previously assembled, closer to the second, fixed bar.

Screw the KB-F connector onto the second bar.

Tighten the connection using a torque wrench on the lock nut. The necessary torque for each type of rebar is indicated in the table on page 28.

TERWA END COUPLERS – TEC-F

The Terwa End coupler TEC-F represents an efficient alternative to the traditional roof-column, beam-column or foundation-column connections. They offer a highly efficient alternative to hooked rebar.

TERWA END COUPLER

The end coupler features the following advantages:

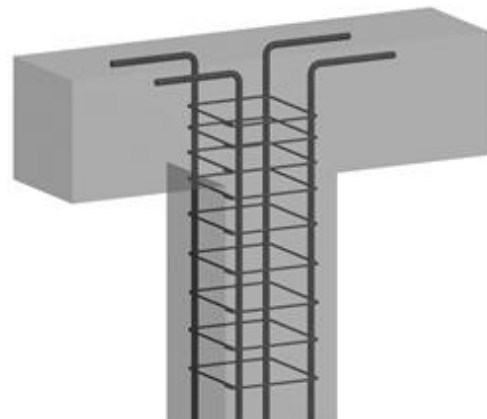
- Minimises the length of the rebar and reduces the congestion inside the concrete element.
- Eliminates the hooks.
- Faster, simpler installation.
- Simplifies the structural design.
- Better anchorage in the concrete element.

CLASSIC SOLUTION

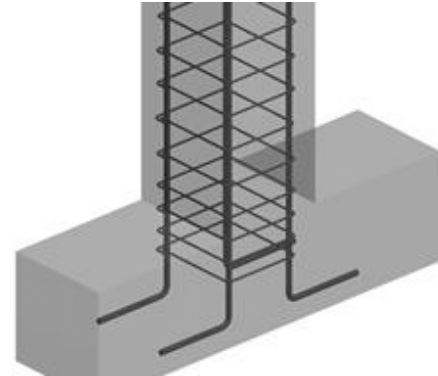
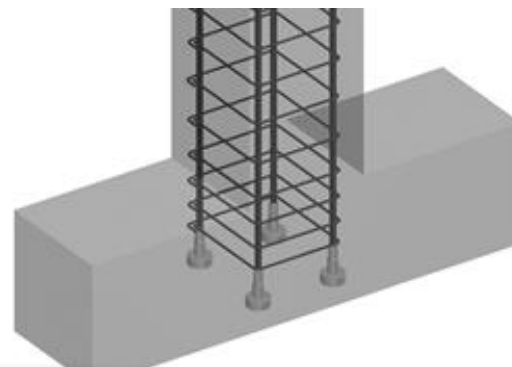
The traditional method consists of a hooked rebar anchorage, which has a series of disadvantages:

- Requires longer lengths of anchorage, which increases rebar congestion.
- Installation is more labour intensive.
- Execution time is longer.
- Hidden costs, especially for larger diameters, as the lap length increases proportionately with the reinforcement steel diameter.
- Reduced safety at construction sites.

Column connection



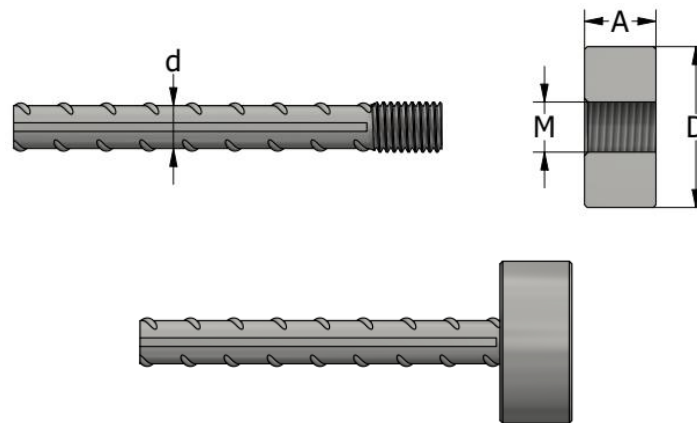
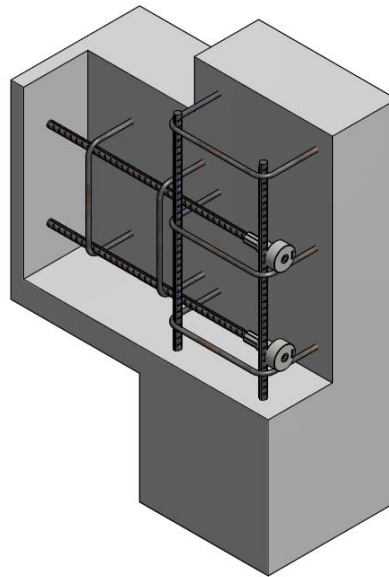
Foundation connection



Terwa end coupler TEC-F consists of a threaded round steel plate galvanised or without protection, which fits the TFS connection creating together a T-headed anchor.

Terwa end couplers meet the ACI 318 and Eurocode 2 standards concerning the embedding lengths for reinforcement steel. The end coupler is designed and tested to ensure proper embedding in concrete, featuring a contact area equal to 9 times the rebar cross section area or a minimum diameter 4 times that of the rebar diameter.

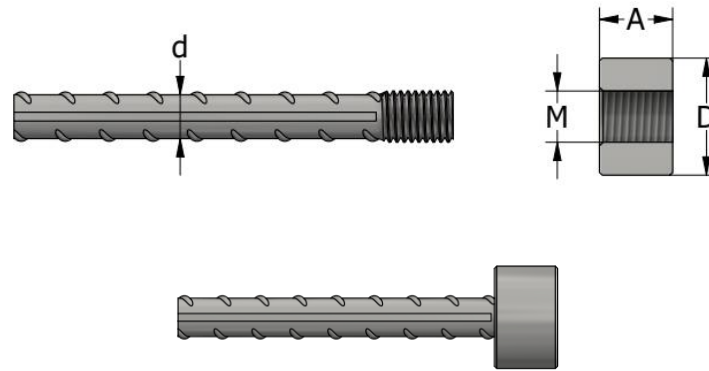
Beam – Column Connection



TFS – TEC-F

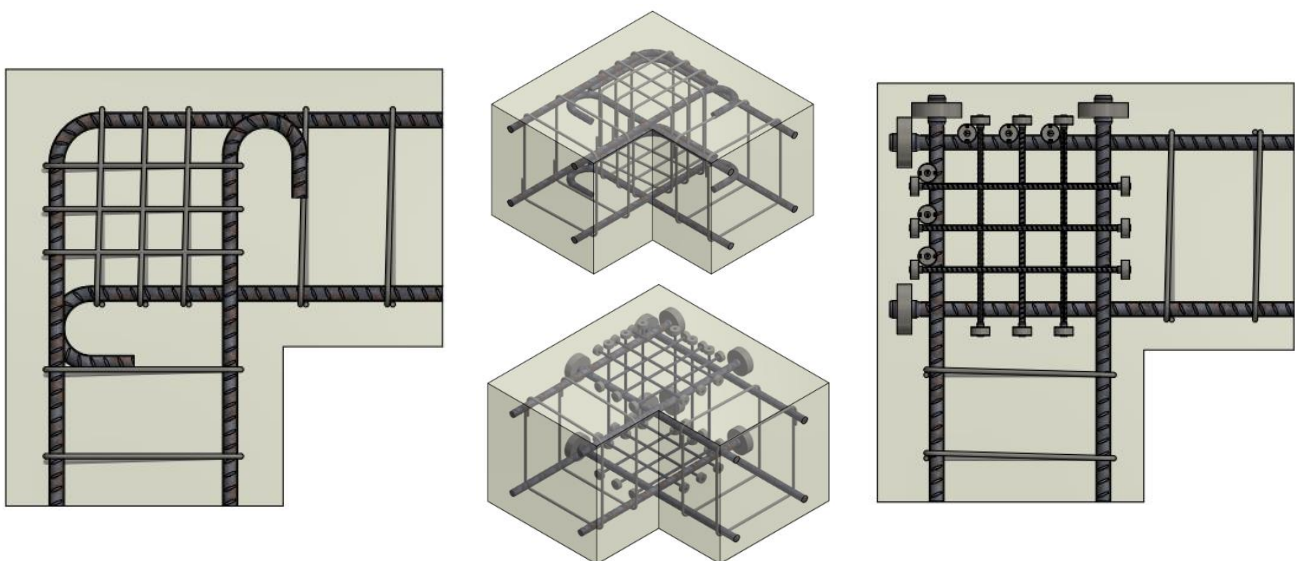
Terwa end couplers TEC-F offer a net bearing area of 9 times the rebar's cross-sectional area. They are either electrolytically galvanized or without any coating.

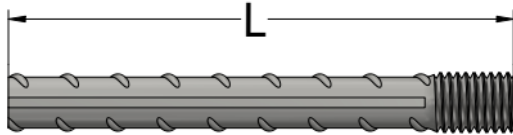
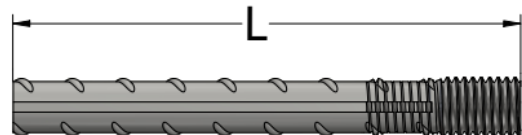
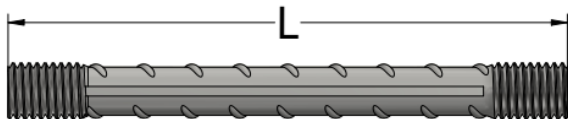
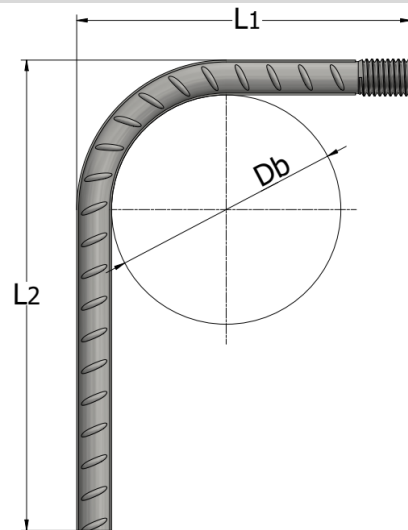
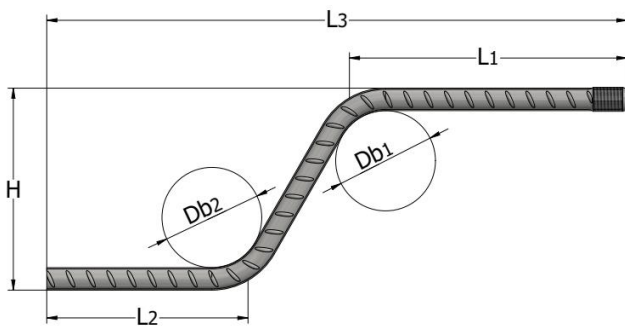
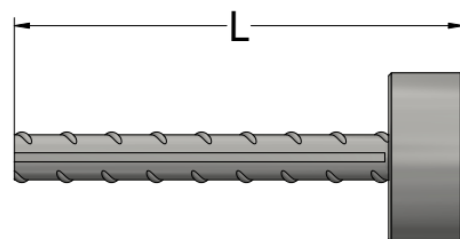
End coupler – TEC-F	Product no.		Thread	Thickness A	D	Rebar diameter (d)	Weight
	Electrolytic galvanized EV	Without coating	Metric	[mm]	[mm]	[mm]	[kg/pc]
TEC-F 12-M14	69387	69388	M14 x 2	14	40	12	0.125
TEC-F 14-M16	69389	69390	M16 x 2	16	45	14	0.180
TEC-F 16-M20	69391	69392	M20 x 2.5	20	52	16	0.295
TEC-F 18-M22	69393	69394	M22 x 2.5	22	60	18	0.435
TEC-F 20-M24	69395	69396	M24 x 3	24	65	20	0.560
TEC-F 22-M27	69397	69398	M27 x 3	27	70	22	0.735
TEC-F 25-M30	69399	69400	M30 x 3.5	30	80	25	1.060
TEC-F 28-M33	69462	69463	M33 x 3.5	33	90	28	1.490
TEC-F 32-M36	69464	69465	M36 x 4	36	105	32	2.220
TEC-F 36-M42	69466	69467	M42 x 4.5	42	115	36	3.090
TEC-F 40-M45	69468	69469	M45 x 4.5	45	130	40	4.240


TFS – TEC-F – small size

Terwa end couplers TEC-F-S offer a net bearing area of 4 times the rebar's cross-sectional area. They are either electrolytically galvanized or without any coating.

End coupler – TEC-F-S	Product no.		Thread	Thickness A	D	Rebar diameter (d)	Weight
	Electrolytic galvanized EV	Without coating	Metric	[mm]	[mm]	[mm]	[kg/pc]
TEC-F-S 12-M14	69810	69811	M14 x 2	14	28	12	0.055
TEC-F-S 14-M16	69812	69813	M16 x 2	16	32	14	0.080
TEC-F-S 16-M20	69814	69815	M20 x 2.5	20	36	16	0.130
TEC-F-S 18-M22	69816	69817	M22 x 2.5	22	42	18	0.195
TEC-F-S 20-M24	69818	69819	M24 x 3	24	45	20	0.240
TEC-F-S 22-M27	69820	69821	M27 x 3	27	50	22	0.335
TEC-F-S 25-M30	69822	69823	M30 x 3.5	30	60	25	0.550
TEC-F-S 28-M33	69824	69825	M33 x 3.5	33	65	28	0.700
TEC-F-S 32-M36	69826	69827	M36 x 4	36	75	32	1.020
TEC-F-S 36-M42	69828	69829	M42 x 4.5	42	85	36	1.535
TEC-F-S 40-M45	69830	69831	M45 x 4.5	45	90	40	1.800



PROPOSAL FOR ORDERING REINFORCEMENT COUPLERS
TFS rebar diam-thread - L

TFS-E rebar diam-thread - L

TFSD rebar diam-thread - L

TFSG and TFSG-E rebar diam-thread - L1 x L2

TFSGG rebar diam-thread - L1 x L2xL3xH

TFS - TEC-F rebar diam-thread - L


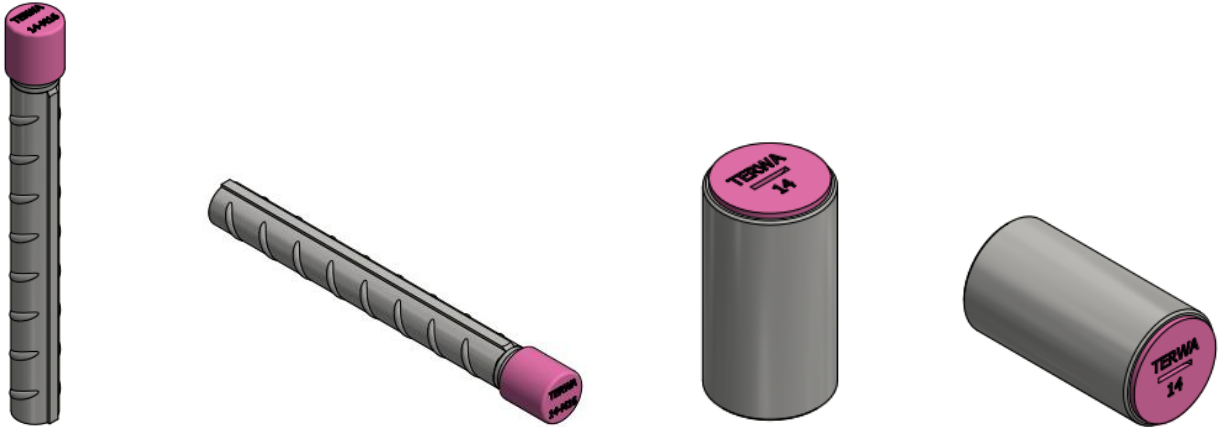
TFS AND KB-F PLASTIC PLUGS AND CAPS

Plastic caps and plugs are used for internal or external thread protection and for easy recognition on the site or in the factory. They are available for all diameters and have colour-matched to the thread dimension and bushes. The markings include the rebar diameter and thread size.



TFS plastic cap

KB-F plastic plug



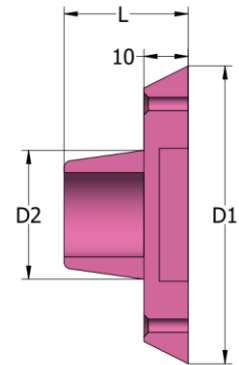
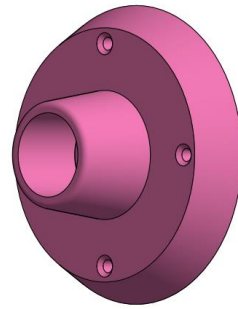
Rebar diameter d [mm]	TFS plastic cap	KB-F plastic plug	Metric	Colour	RAL Code
			M		
12	69108	69097	M14 x 2	Red	3000
14	69109	69098	M16 x 2	Pink	3015
16	69110	69099	M20 x 2.5	Light green	6019
18	69111	69100	M22 x 2.5	Light brown	8025
20	69112	69101	M24 x 3	Dark grey	7016
22	69113	69102	M27 x 3	Yellow	1016
25	69114	69103	M30 x 3.5	Dark green	6001
28	69115	69104	M33 x 3.5	White	9010
32	69116	69105	M36 x 4	Blue	5012
36	69117	69106	M42 x 4.5	Light grey	7001
40	69118	69107	M45 x 4.5	Black	9017

FIXING FLANGE RF-10

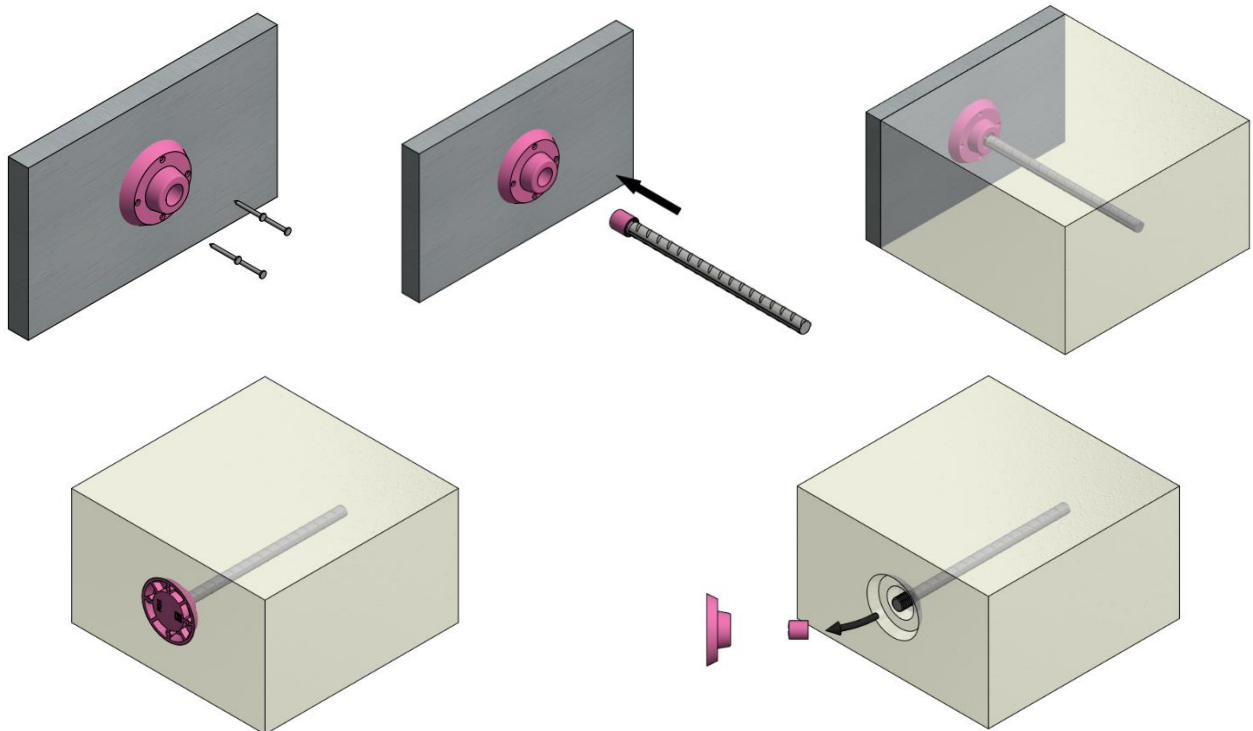
Nailing plates recess former RF-10 are used for fixing the TFS and TFSD rebar connection to the formwork. The fixing flange ensures a minimal recess around the threaded head of the TFS.

RF10 are produced having the same colour code as the protection cap of the TFS.

After the RF and the protection cap are removed, a cavity will remain in the precast element to connect the TFS through the KB-F coupler.

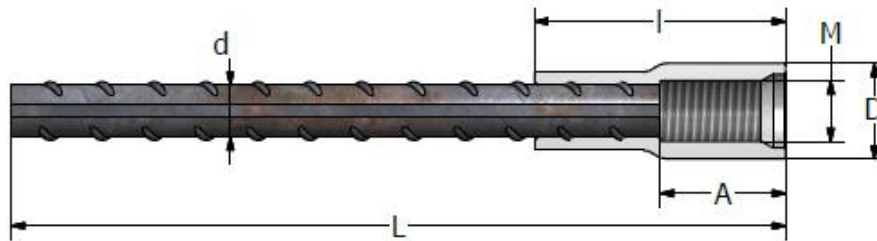
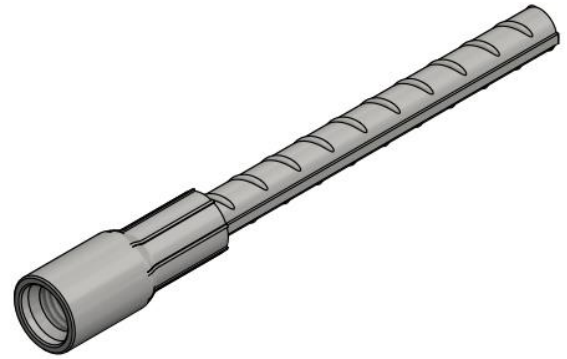


Rebar diameter d	RF-10	TFS	D1	D2	L	Colour	RAL Code
[mm]		M	[mm]	[mm]	[mm]		
12	69798	M14 x 2	60	25	25	Red	3000
14	69799	M16 x 2	60	27	27	Pink	3015
16	69800	M20 x 2.5	70	32	31	Light green	6019
18	69801	M22 x 2.5	70	35	33	Light brown	8025
20	69802	M24 x 3	76	38	35	Dark grey	7016
22	69803	M27 x 3	76	41	38	Yellow	1016
25	69804	M30 x 3.5	88	45	41	Dark green	6001
28	69805	M33 x 3.5	88	50	44	White	9010
32	69806	M36 x 4	95	55	47	Blue	5012
36	69807	M42 x 4.5	105	63	53	Light grey	7001
40	69808	M45 x 4.5	110	67	56	Black	9017

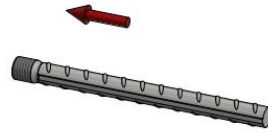
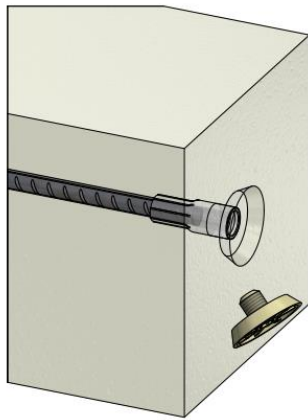


COLD FORGED TFS REINFORCEMENT COUPLER IN CONNECTION WITH PSA REBAR COUPLER

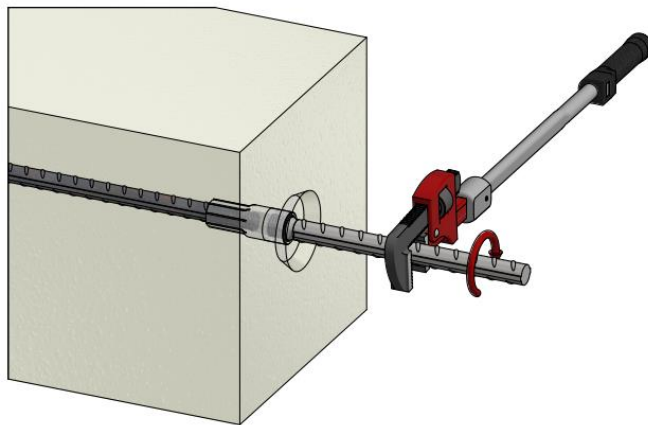
The female reinforcement coupler PSA consists of a reinforcement steel bar and a crimped PKB sleeve with interior metric thread on one end of the reinforcement. In connection with a male reinforcement coupler TFS, the PSA coupler ensures uninterrupted reinforcement. This coupler system can be produced in various dimensions. The PKB sleeves are constructed from structural steel, electrolytically galvanised or hot-dip galvanised. The reinforcement steel quality is detailed on page 4. The rebar can also be made of stainless steel W1.4362 or its equivalent. On request, the PKB sleeves can be manufactured in stainless steel.



PSA Product description	Sleeve diameter	Sleeve length	Rebar diameter	Thread	
	D	l	d	Metric	A
	[mm]	[mm]	[mm]	M	[mm]
PSA 16 - M20 - L	28	86	16	20	38
PSA 18 - M22 - L	32	92	18	22	40
PSA 20 - M24 - L	34	99	20	24	42
PSA 22 - M27 - L	38	107	22	27	45
PSA 25 - M30 - L	42.5	117	25	30	52

REINFORCEMENT COUPLER TFS ASSEMBLED WITH AN INSTALLED PSA COUPLER

Place and rotate TFS coupler manually until the couplers are fastened.



Finish the connection using a special TERWA torque wrench to tighten the connection. The connection must be sufficiently tight to prevent movement during concrete placement. The necessary torque for each type of rebar is indicated on page 28.

Note: Make sure both parts of the connecting bars are perfectly aligned. Any misalignment may result in reduced concrete coverage, improper bar spacing or issues with mounting the connecting element. Do not perform any corrective bending in the threaded area of the bar.

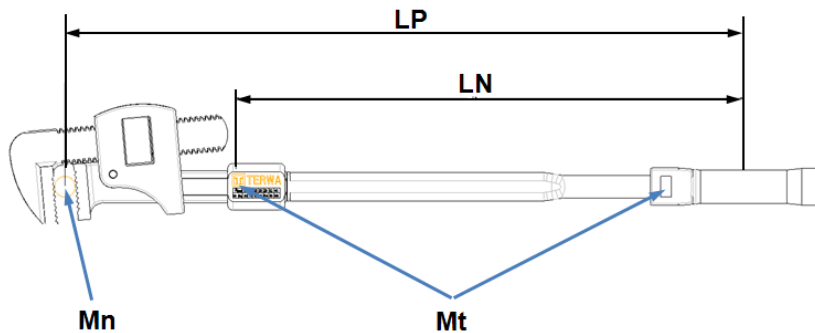
TERWA TORQUE WRENCH

The Terwa torque wrench is specially designed for correctly mounting the Terwa coupler on site and at the factories. All Terwa wrenches are delivered with a calibration report and work instructions. The torque values for all rebar diameters are marked on the wrench. The torque values for all Terwa couplers are listed below.

Reinforcement diameter [mm]	Necessary torque for each type of rebar [Nm]	Setting torque using wrench Mt [Nm]
12	60	60
14	70	60
16	80	60
18	90	70
20	100	75
22	110	82
25	125	93
28	140	104
32	160	119
36	180	133
40	200	148



TERWA torque wrench

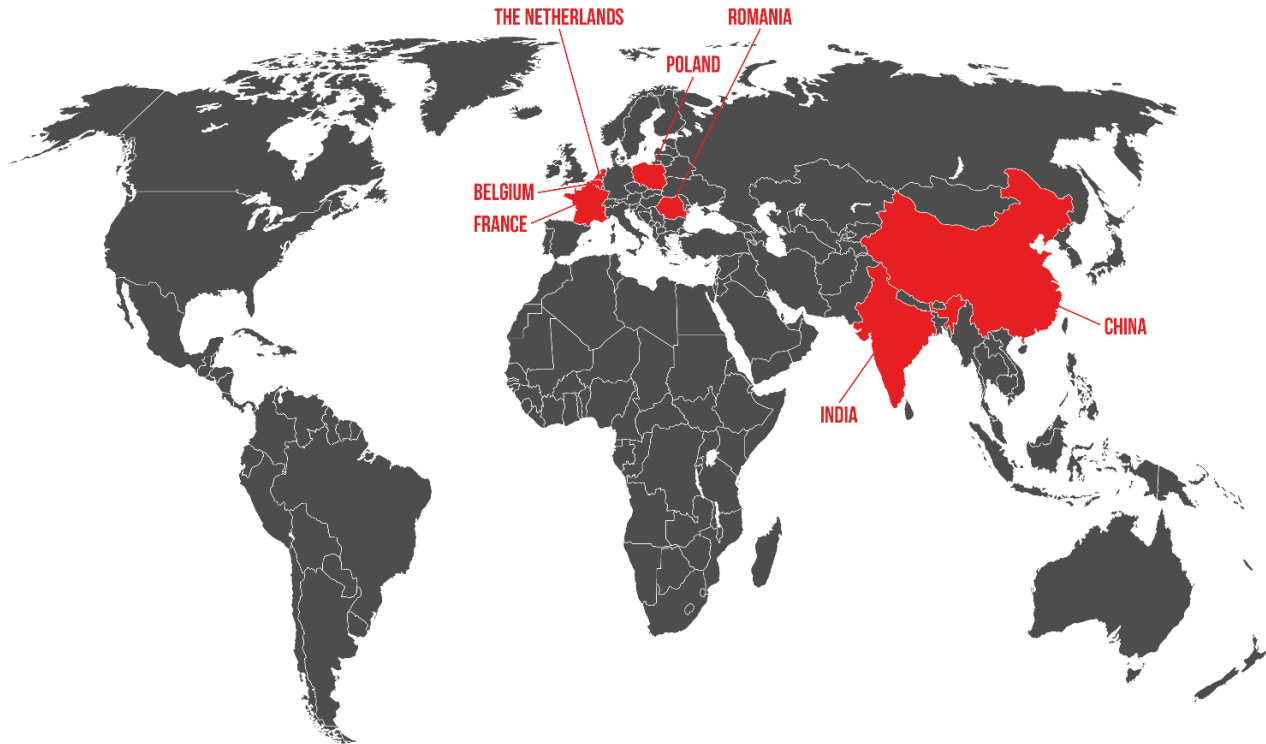


Mn – required torque
Mt – setting torque using wrench
LP – length to middle of each reinforcement steel
LN – standard length wrench

$$Mt = Mn \times LN / LP$$

TERWA wrench dimensions

CONTACT



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