

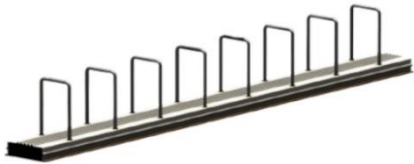
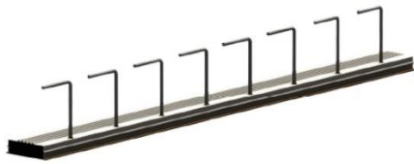

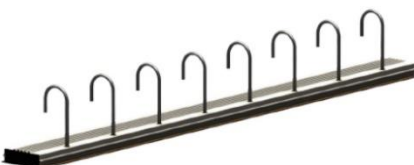
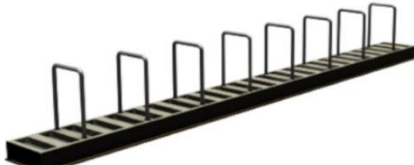
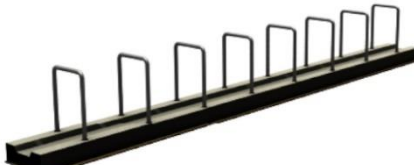


## TECHNICAL DOCUMENTATION



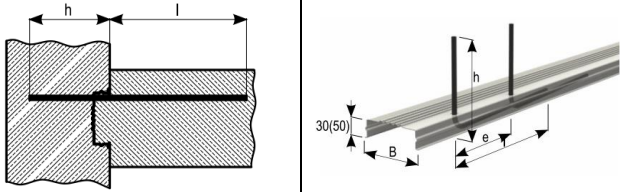
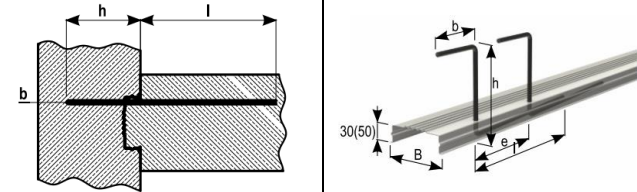
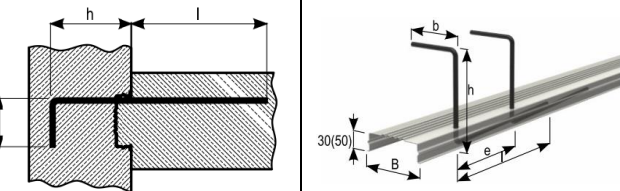
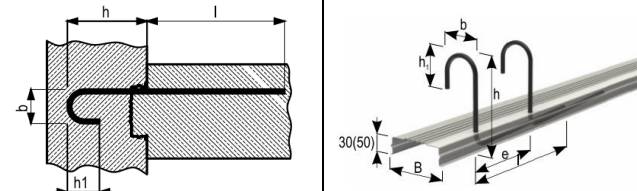
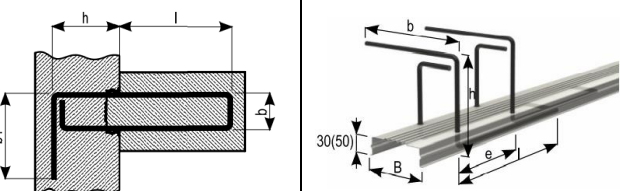
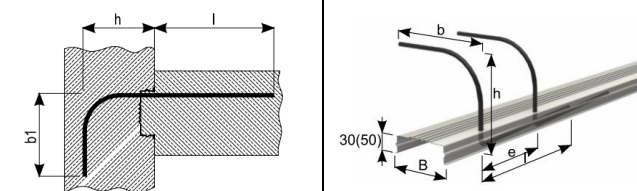
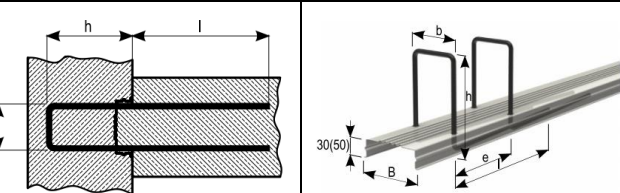
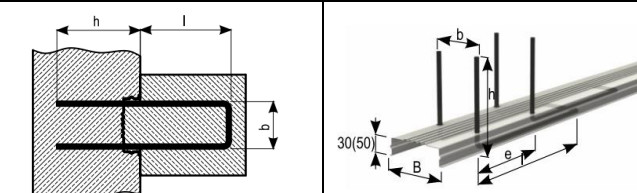
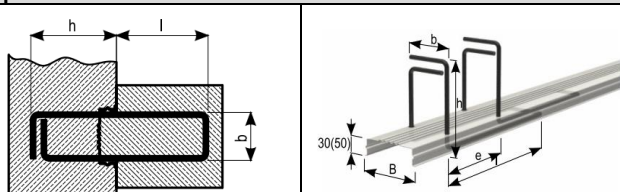
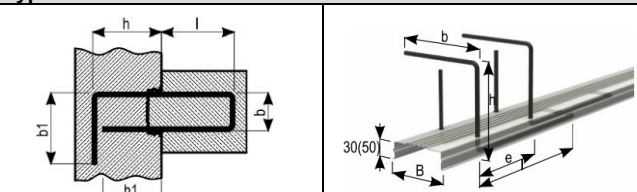
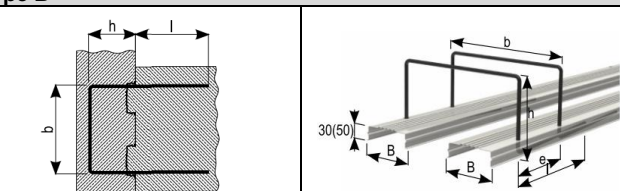
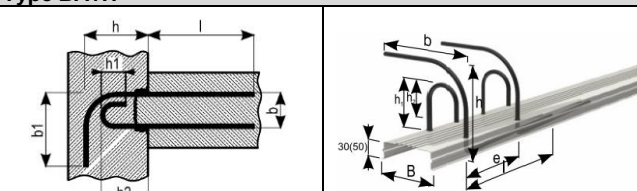
## REINFORCEMENT SYSTEMS | **TERWA STARTER BOX**



**PRODUCT RANGE**

<b>TERWA STARTER BOXES</b>		
<p><b>TYPE S</b></p>  <p>Page 9</p>	<p><b>TYPE WH</b></p>  <p>Page 11</p>	<p><b>TYPE W</b></p>  <p>Page 12</p>
<p><b>TYPE H</b></p>  <p>Page 13</p>	<p><b>TYPE TP</b></p>  <p>Page 14</p>	<p><b>TYPE TW</b></p>  <p>Page 15</p>
<b>TOOLS</b>		
<p><b>PIPE SHAPED FERRULE WITH LATCH</b></p>  <p>Page 13</p>	<p><b>BAR BENDING FERRULE</b></p>  <p>Page 13</p>	

**INQUIRY FORM**

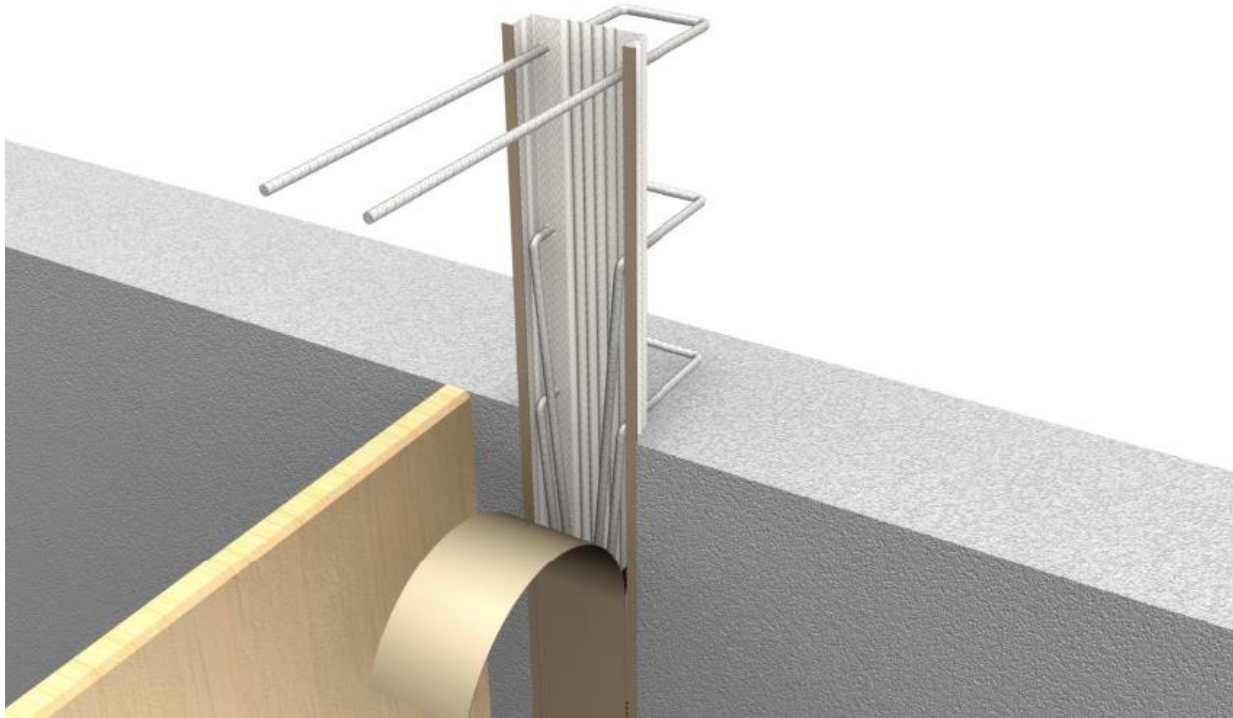
<b>Type W</b> 		<b>TypeWH</b> 	
<b>Type WS</b> 		<b>Type H</b> 	
<b>Type BK</b> 		<b>Type BA</b> 	
<b>Type S</b> 		<b>Type KO</b> 	
<b>Type K</b> 		<b>Type KH</b> 	
<b>Type B</b> 		<b>Type BA+H</b> 	

L.p.	Type	Rail width B [mm]	Bar diameter $\phi$ [mm]	Bar spacing E [cm]	Dimensions						Length [m]	Amount of Elements [pcs]
					h [cm]	b [cm]	l [cm]	h [cm]	h [cm]	b [cm]		

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## GENERAL INFORMATION



### PRODUCT DESCRIPTION

TERWA starter boxes are composed of the longitudinal steel profiles (rails) made by perforated, galvanized steel plate. Ribbed reinforcing bars are embedded in the profiles. Reinforcing bars from one side of the profile form anchoring loops, and from the other side- are bent to it and covered by the thick plastic tape. Concrete reinforcement bended starter boxes are used to perform vertical and horizontal connections of the elements of reinforced concrete constructions, concreted in stages and the precast elements with monolithic. Use of connecting set TERWA ensures fulfilment all requirements specified by standards for proper form of contact anastomosis. Standards for design concrete constructions assume that with the correct shape of the joint we can treat the construction element as homogeneous and permanently compound.

### USE

Reinforcement bended Starter Boxes allow execution of connection reinforced concrete structural elements, concreted in various stages of construction, i.e. in connection of the walls, floors to walls, staircase landings, balconies, consoles etc. It allows significantly reduce the duration of the investment and reducing the period of lease elements of formwork system.

### ADVANTAGES

- Simplified execution of constructing joins and additional concreting
- Easy and fast assembly - the component is attached to the formwork by nails
- Specially contoured shape of the perforated rail provides proper preparation of the contact surface on the connection of the two elements, implemented at different time
- Thanks to deliberately roughened joint with optimally shaped furrow (notch) entirely transfer shearing forces occurring in the connector
- It allows for continuity of reinforcement and required length of anchoring bars in elements of reinforcement concrete
- The shape of the rail guarantees the correct depth of concrete coverage of the reinforcing bars
- The rail is made from galvanized steel plate, what protects it by aggressive influence of environment at the storage stage and during realization
- The shape and construction of the rail provides stability during concreting and protect by permeation of the concrete inside the profile
- Thick plastic tape ensures durable protection of reinforcement bars at the time of installation the rail to the formwork. Perforation cut in the rail allows for its quick removal and commencement of reinforce works
- Possibility of matching to the different shapes of formwork (i.e. arch formworks)
- It can be adapted to different systems of reinforcement in elements of reinforced concrete-non-standard elements, on inquiry
- Reinforcement bended Starter Boxes have technical approval which can be asked for at TERWA Construction Group

## TECHNICAL DETAILS

- Component length: 1,25 m
- Rail width: 60, 80, 110, 140, 160, 190, 220, 240 mm
- Reinforcement bar diameter:  $\phi$  8, 10, 12, 14, 16
- Rail bar spacing: 10, 15, 20, 25, 30
- Bending diameter:  $6 \times \phi$  (bar diameter)
- Rail recess depth: 30 mm
- Reinforcement bars:
  - Yield strength  $R_e \geq 500 \text{MPa}$
  - Tensile strength  $R_m \geq 550$

## Designation examples:



Additionally, construction of the TERWA Starter Boxes gives possibility of performance non-standard elements:

- In non-standard length
- By spacing bars other than standard
- With bigger thickness of the rail (more than 30 mm)
- With the other shape of anchoring loops
- With other bending diameters
- For wider joints there is the possibility of performing double-line connections (comprising two parallel rails)
- The bars Starter Boxes can be made with diameter 14,16 on inquiry

This solution it's shown in the Technical Approval published by ITB in Warsaw

## THE ANCHORAGE LENGTH AND OVERLAPPING THE BARS ACCORDING TO PN-EN 1991-1-1

### BASIC ANCHOR LENGTH $l_{B,RQD}$ WG PN-EN 1992-1-1

When calculating the required anchor length, one should consider the steel grade and those properties of bars that influence adhesiveness.

$$l_{B,RQD} = \frac{\phi}{4} \frac{\sigma_{sd}}{f_{bd}}$$

- $\sigma_{sd}$  - calculational tensile stress at the spot from which the anchor length is measured  
 $f_{bd}$  - calculational value of concrete tensile strength  
 $\phi$  - bar diameter

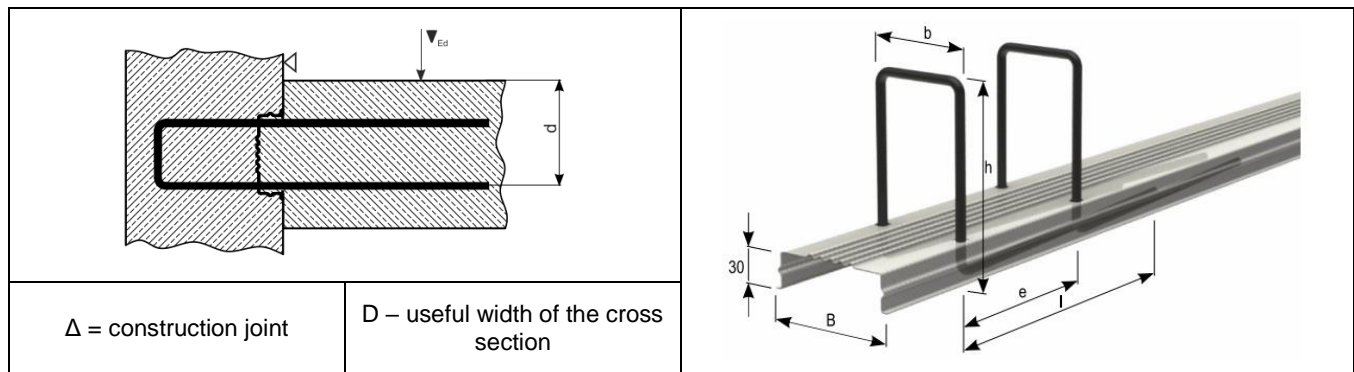
### OVERLAP LENGTH $l_0$ WG PN-EN 1992-1-1

The calculation overlap length is:

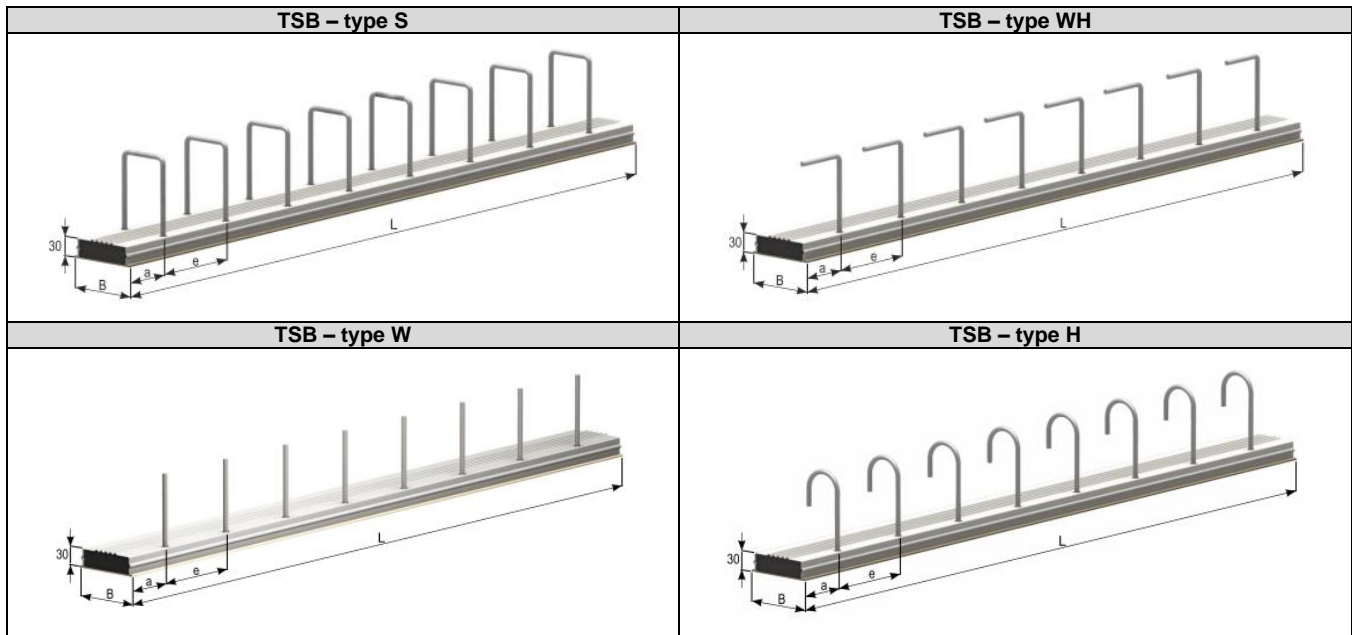
$$l_0 = a_1 \cdot a_2 \cdot a_3 \cdot a_5 \cdot a_6 \cdot l_{b,rqd} \quad \text{but not less than } l_{0,min}$$

- $l$  - basic anchor length  
 $a_1, a_2, a_3, a_5, a_6$  -coefficient values according to table 8.2 of the standard  
 $l_{0,min} = \{0,3 \cdot a_6 \cdot l_{b,rqd}; 15\phi; 200\text{mm}\}$



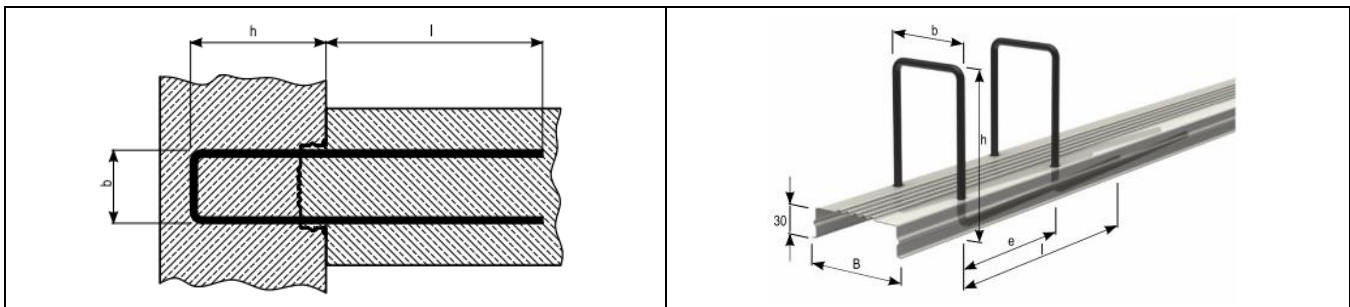
**SHEAR LOAD CAPACITY TRANSVERSE TO THE CASE**


Shear load resistance $V_{Ed}$ [kN/m]							
$\phi$ [mm]/e[cm]	B=80mm	B=110mm	B=140mm	B=160mm	B=190mm	B=220mm	B=240mm
<b>C20/25</b>							
8/10	-	60,27	72,87	81,27	93,87	106,47	114,87
8/15	42,98	55,58	68,18	76,58	89,18	101,78	110,18
8/20	40,63	53,23	65,83	74,23	86,83	87,37	87,37
8/25	39,23	51,83	64,43	69,90	69,90	69,90	69,90
8/30	-	50,89	58,25	58,25	58,25	58,25	58,25
10/10	-	68,18	80,78	89,18	101,78	114,38	122,78
10/15	48,25	60,85	73,45	81,85	94,45	107,05	115,45
10/20	44,59	57,19	69,79	78,19	90,79	103,39	111,79
10/25	42,39	54,99	67,59	75,99	88,59	101,19	109,22
10/30	-	53,53	66,13	74,53	87,13	91,01	91,01
12/10	-	77,00	90,45	98,85	111,45	124,05	132,45
12/15	-	67,30	79,90	88,30	100,90	113,50	121,90
12/20	-	62,03	74,63	83,30	95,63	108,23	116,63
12/25	-	58,86	71,46	79,86	92,46	105,06	113,46
12/30	-	56,75	69,35	77,75	90,35	102,95	111,35
<b>C25/30</b>							
8/10	-	72,32	87,44	97,52	112,64	127,76	137,84
8/15	51,57	66,69	81,81	91,89	107,01	116,50	116,50
8/20	48,76	63,88	79,00	87,37	87,37	87,37	87,37
8/25	47,07	62,19	69,90	69,90	69,90	69,90	69,90
8/30	-	58,25	58,25	58,25	58,25	58,25	58,25
10/10	-	81,82	96,94	107,02	122,14	137,26	147,34
10/15	57,90	73,02	88,14	98,22	113,34	128,46	138,54
10/20	53,51	68,63	83,75	93,83	108,95	124,07	134,15
10/25	50,87	65,99	81,11	91,19	106,31	109,22	109,22
10/30	-	64,23	79,35	89,43	91,01	91,01	91,01
12/10	-	92,40	108,54	118,62	133,74	148,86	158,94
12/15	-	80,76	95,88	105,96	121,08	136,20	146,28
12/20	-	74,43	89,55	99,63	114,75	129,87	139,95
12/25	-	70,63	85,75	95,83	110,95	126,07	136,15
12/30	-	68,10	83,22	93,30	108,42	123,54	131,06
<b>C30/37</b>							
8/10	-	80,36	97,16	108,36	125,16	141,96	153,16
8/15	57,30	74,10	90,90	102,10	116,50	116,50	116,50
8/20	54,18	70,98	87,37	87,37	87,37	87,37	87,37
8/25	52,30	69,10	69,90	69,90	69,90	69,90	69,90
8/30	-	58,25	58,25	58,25	58,25	58,25	58,25
10/10	-	90,91	107,71	118,91	135,71	152,51	163,71
10/15	64,34	81,14	97,94	109,14	125,94	142,74	153,94
10/20	59,45	76,25	93,05	104,25	121,05	136,52	136,52
10/25	56,52	73,32	90,12	101,32	109,22	109,22	109,22
10/30	-	71,37	88,17	91,01	91,01	91,01	91,01
12/10	-	102,67	120,60	131,80	148,60	165,40	176,60
12/15	-	89,73	106,53	117,73	134,53	151,33	162,53
12/20	-	82,70	99,50	110,70	127,50	144,30	155,50
12/25	-	78,48	95,28	106,46	123,28	140,08	151,28
12/30	-	75,67	92,47	103,67	120,47	131,06	131,06

**STANDARD COMPONENTS**


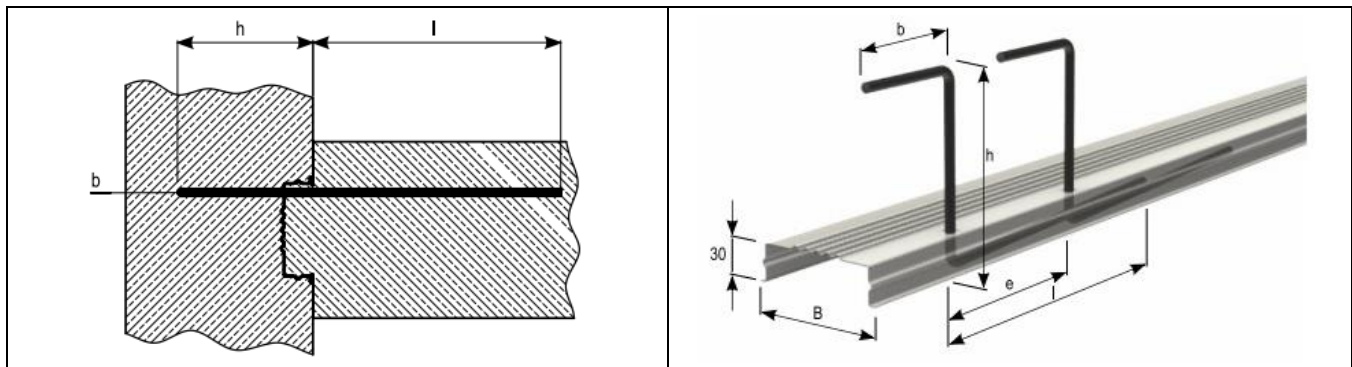
Reinforcement bars system in the Starter Box rails		
The bar spacing in the rail e [cm]	The distance of the first bar from the end of the raila [cm]	Quantity of the bars in the rail [pcs.]
10	5,5	12
15	8,0	8
20	10,5	6
25	12,5	5
30	16,0	4



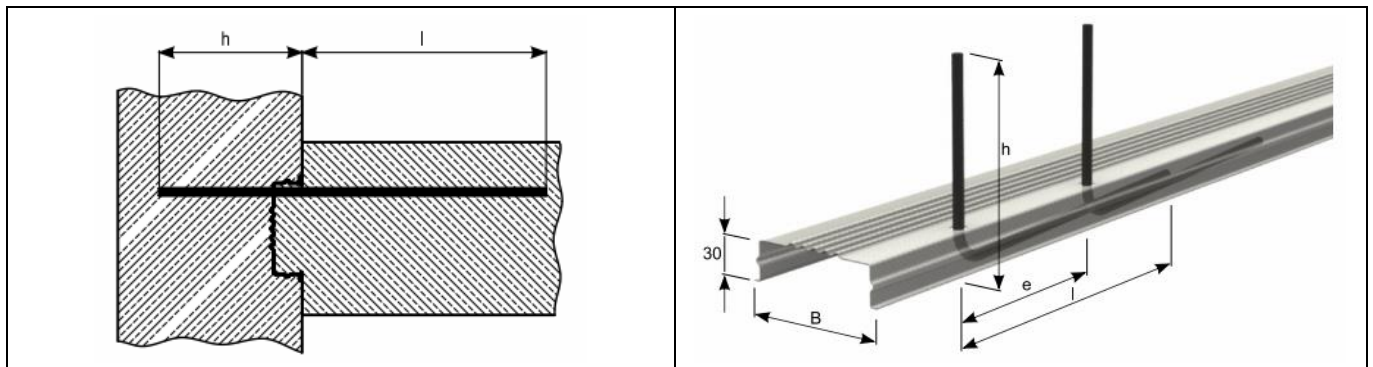
**TERWA STARTER BOX – TYPE S**


Symbol	Rail width B [mm]	Bar diameter $\phi$ [mm]	Bar spacing E [cm]	h [cm]	b [cm]	l [cm]	Measurement Unit	Packaging [pcs/palette]	Art. No.
<b>TSB – type S</b>									
TSB type S 80-8/15	80	8	15	15	6	32	Mb	150pcs.=187,5	64646
TSB type S 80-8/20	80	8	20	15	6	32	mb	150	64647
TSB type S 80-8/25	80	8	25	15	6	32	mb	150	64648
TSB type S 80-10/15	80	10	15	15	6	29	mb	150	64649
TSB type S 80-10/20	80	10	20	15	6	36	mb	150	64650
TSB type S 80-10/25	80	10	25	15	6	39	mb	150	64651
TSB type S 110-8/10	110	8	10	15	9	32	mb	80pcs.=100m	64652
TSB type S 110-8/15	110	8	15	15	9	32	mb	80	64653
TSB type S 110-8/20	110	8	20	15	9	32	mb	80	64654
TSB type S 110-8/25	110	8	25	15	9	32	mb	80	64655
TSB type S 110-8/30	110	8	30	15	9	32	mb	80	64656
TSB type S 110-10/10	110	10	10	15	9	39	mb	80	64657
TSB type S 110-10/15	110	10	15	15	9	39	mb	80	64658
TSB type S 110-10/20	110	10	20	15	9	39	mb	80	64659
TSB type S 110-10/25	110	10	25	15	9	39	mb	80	64660
TSB type S 110-10/30	110	10	30	15	9	39	mb	80	64661
TSB type S 110-12/10	110	12	10	15	9	30	mb	80	64662
TSB type S 110-12/15	110	12	15	15	9	33	mb	80	64663
TSB type S 110-12/20	110	12	20	15	9	46	mb	80	64664
TSB type S 110-12/25	110	12	25	15	9	46	mb	80	64665
TSB type S 110-12/30	110	12	30	15	9	46	mb	80	64666
TSB type S 140-8/10	140	8	10	15	12	32	mb	108pcs.=135m	64667
TSB type S 140-8/15	140	8	15	15	12	32	mb	108	64668
TSB type S 140-8/20	140	8	20	15	12	32	mb	108	64669
TSB type S 140-8/25	140	8	25	15	12	32	mb	108	64670
TSB type S 140-8/30	140	8	30	15	12	32	mb	108	64671
TSB type S 140-10/10	140	10	10	15	12	39	mb	108	64672
TSB type S 140-10/15	140	10	15	15	12	39	mb	108	64673
TSB type S 140-10/20	140	10	20	15	12	39	mb	108	64674
TSB type S 140-10/25	140	10	25	15	12	39	mb	108	64675
TSB type S 140-10/30	140	10	30	15	12	39	mb	108	64676
TSB type S 140-12/10	140	12	10	15	12	40	mb	108	64677
TSB type S 140-12/15	140	12	15	15	12	46	mb	108	64678
TSB type S 140-12/20	140	12	20	15	12	46	mb	108	64679
TSB type S 140-12/25	140	12	25	15	12	46	mb	108	64680
TSB type S 140-12/30	140	12	30	15	12	46	mb	108	64681
TSB type S 160-8/10	160	8	10	15	14	32	mb	84pcs.=105m	64682
TSB type S 160-8/15	160	8	15	15	14	32	mb	84	64683
TSB type S 160-8/20	160	8	20	15	14	32	mb	84	64684
TSB type S 160-8/25	160	8	25	15	14	32	mb	84	64685
TSB type S 160-8/30	160	8	30	15	14	32	mb	84	64686
TSB type S 160-10/10	160	10	10	15	14	39	mb	84	64687
TSB type S 160-10/15	160	10	15	15	14	39	mb	84	64688
TSB type S 160-10/20	160	10	20	15	14	39	mb	84	64689
TSB type S 160-10/25	160	10	25	15	14	39	mb	84	64690
TSB type S 160-10/30	160	10	30	15	14	39	mb	84	64691
TSB type S 160-12/10	160	12	10	15	14	43	mb	84	64692
TSB type S 160-12/15	160	12	15	15	14	46	mb	84	64693
TSB type S 160-12/20	160	12	20	15	14	46	mb	84	64694
TSB type S 160-12/25	160	12	25	15	14	46	mb	84	64695
TSB type S 160-12/30	160	12	30	15	14	46	mb	84	64696

Symbol	Rail width B [mm]	Bar diameter $\phi$ [mm]	Bar spacing E [cm]	h [cm]	b [cm]	l [cm]	Measurement Unit	Packaging [pcs/palette]	Art. No.
<b>TSB – type S</b>									
TSB type S 190-8/10	190	8	10	15	17	32	mb	72pcs.=90m	64697
TSB type S 190-8/15	190	8	15	15	17	32	mb	72	64698
TSB type S 190-8/20	190	8	20	15	17	32	mb	72	64699
TSB type S 190-8/25	190	8	25	15	17	32	mb	72	64700
TSB type S 190-8/30	190	8	30	15	17	32	mb	72	64701
TSB type S 190-10/10	190	10	10	15	17	39	mb	72	64702
TSB type S 190-10/15	190	10	15	15	17	39	mb	72	64703
TSB type S 190-10/20	190	10	20	15	17	39	mb	72	64704
TSB type S 190-10/25	190	10	25	15	17	39	mb	72	64705
TSB type S 190-10/30	190	10	30	15	17	39	mb	72	64706
TSB type S 190-12/10	190	12	10	15	17	46	mb	72	64707
TSB type S 190-12/15	190	12	15	15	17	46	mb	72	64708
TSB type S 190-12/20	190	12	20	15	17	46	mb	72	64709
TSB type S 190-12/25	190	12	25	15	17	46	mb	72	64710
TSB type S 190-12/30	190	12	30	15	17	46	mb	72	64711
TSB type S 220-8/10	220	8	10	15	20	32	mb	48pcs.=60m	64712
TSB type S 220-8/15	220	8	15	15	20	32	mb	48	64713
TSB type S 220-8/20	220	8	20	15	20	32	mb	48	64714
TSB type S 220-8/25	220	8	25	15	20	32	mb	48	64715
TSB type S 220-8/30	220	8	30	15	20	32	mb	48	64716
TSB type S 220-10/10	220	10	10	15	20	39	mb	48	64717
TSB type S 220-10/15	220	10	15	15	20	39	mb	48	64718
TSB type S 220-10/20	220	10	20	15	20	39	mb	48	64719
TSB type S 220-10/25	220	10	25	15	20	39	mb	48	64720
TSB type S 220-10/30	220	10	30	15	20	39	mb	48	64721
TSB type S 220-12/10	220	12	10	15	20	46	mb	48	64722
TSB type S 220-12/15	220	12	15	15	20	46	mb	48	64723
TSB type S 220-12/20	220	12	20	15	20	46	mb	48	64724
TSB type S 220-12/25	220	12	25	15	20	46	mb	48	64725
TSB type S 220-12/30	220	12	30	15	20	46	mb	48	64726
TSB type S 240-8/10	240	8	10	15	22	32	mb	48pcs.=60m	64727
TSB type S 240-8/15	240	8	15	15	22	32	mb	48	64728
TSB type S 240-8/20	240	8	20	15	22	32	mb	48	64729
TSB type S 240-8/25	240	8	25	15	22	32	mb	48	64730
TSB type S 240-8/30	240	8	30	15	22	32	mb	48	64731
TSB type S 240-10/10	240	10	10	15	22	39	mb	48	64732
TSB type S 240-10/15	240	10	15	15	22	39	mb	48	64733
TSB type S 240-10/20	240	10	20	15	22	39	mb	48	64734
TSB type S 240-10/25	240	10	25	15	22	39	mb	48	64735
TSB type S 240-10/30	240	10	30	15	22	39	mb	48	64736
TSB type S 240-12/10	240	12	10	15	22	46	mb	48	64737
TSB type S 240-12/15	240	12	15	15	22	46	mb	48	64738
TSB type S 240-12/20	240	12	20	15	22	46	mb	48	64739
TSB type S 240-12/25	240	12	25	15	22	46	mb	48	64740
TSB type S 240-12/30	240	12	30	15	22	46	mb	48	64741

**TERWA STARTER BOX – TYPE WH**


Symbol	Rail width B [mm]	Bar diameter $\phi$ [mm]	Bar spacing E [cm]	h [cm]	b [cm]	l [cm]	Measurement Unit	Packaging [pcs/palette]	Art. No.
<b>TSB – type WH</b>									
TSB type WH 60-8/10	60	8	10	15	8	32	mb	200pcs.=250m	64742
TSB type WH 60-8/15	60	8	15	15	8	32	mb	200	64743
TSB type WH 60-8/20	60	8	20	15	8	32	mb	200	64744
TSB type WH 60-8/25	60	8	25	15	8	32	mb	200	64745
TSB type WH 60-8/30	60	8	30	15	8	32	mb	200	64746
TSB type WH 60-10/15	60	10	15	15	8	39	mb	200	64747
TSB type WH 60-10/20	60	10	20	15	8	39	mb	200	64748
TSB type WH 60-10/25	60	10	25	15	8	39	mb	200	64749
TSB type WH 80-8/15	80	8	15	15	8	32	mb	150pcs.=187,5m	64750
TSB type WH 80-8/20	80	8	20	15	8	32	mb	150	64751
TSB type WH 80-8/25	80	8	25	15	8	32	mb	150	64752
TSB type WH 80-8/30	80	8	30	15	8	32	mb	150	64753
TSB type WH 80-10/15	80	10	15	15	8	39	mb	150	64754
TSB type WH 80-10/20	80	10	20	15	8	39	mb	150	64755
TSB type WH 80-10/25	80	10	25	15	8	39	mb	150	64756
TSB type WH 80-12/10	80	12	10	15	8	39	mb	150	64757
TSB type WH 80-12/15	80	12	15	15	8	46	mb	150	64758
TSB type WH 80-12/20	80	12	20	15	8	46	mb	150	64759
TSB type WH 80-12/25	80	12	25	15	8	46	mb	150	64760



**TERWA STARTER BOX – TYPE W**


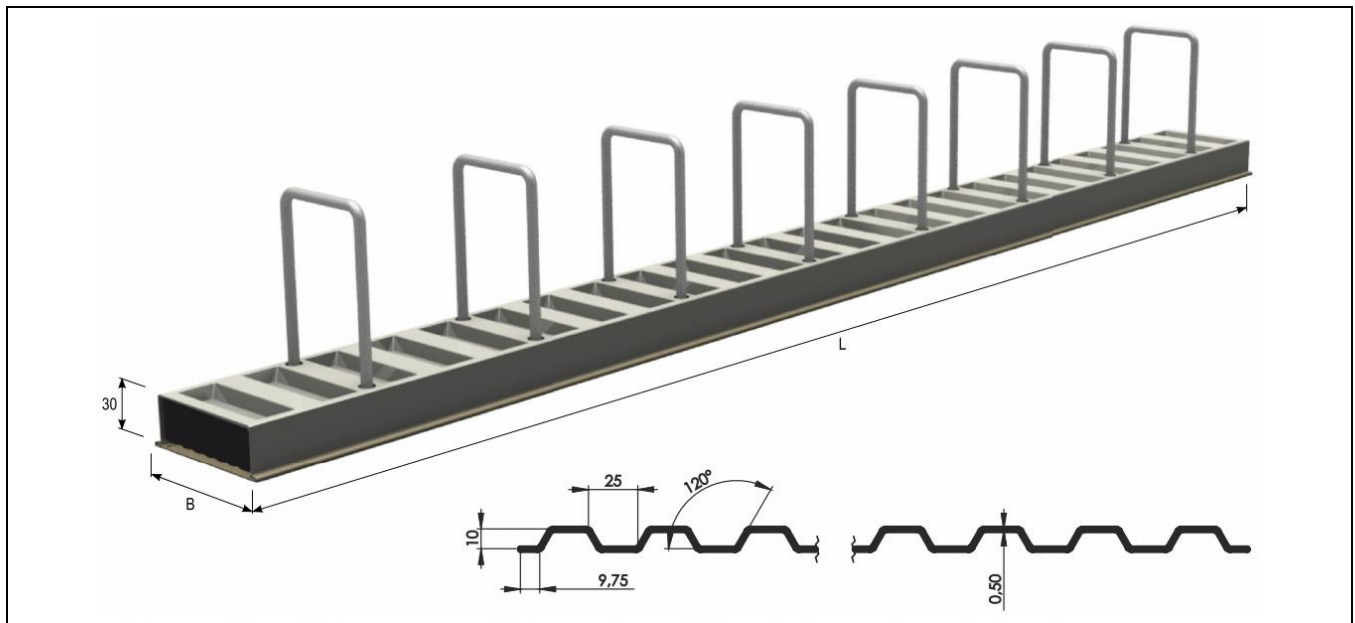
Symbol	Rail width B [mm]	Bar diameter $\phi$ [mm]	Bar spacing E [cm]	h [cm]	b [cm]	l [cm]	Measurement Unit	Packaging [pcs/palette]	Art. No.
<b>TSB – type W</b>									
TSB type W 80-8/15	80	8	15	15	.	32	mb	150pcs.=187,5m	64761
TSB type W 80-8/20	80	8	20	15	.	32	mb	150	64762

**TERWA STARTER BOX – TYPE H**

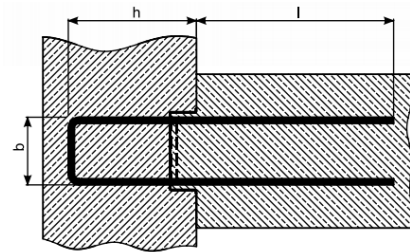
Symbol	Rail width B [mm]	Bar diameter $\phi$ [mm]	Bar spacing E [cm]	h [cm]	h' [cm]	b [cm]	l [cm]	Measurement Unit	Packaging [pcs/palette]	Art. No.
<b>TSB – type H</b>										
TSB type H 60-8/10	60	8	10	15	7	6	32	mb	200pcs.=250m	64763
TSB type H 60-8/15	60	8	15	15	7	6	32	mb	200	64764
TSB type H 60-8/20	60	8	20	15	7	6	32	mb	200	64765
TSB type H 60-8/25	60	8	25	15	7	6	32	mb	200	64766
TSB type H 60-8/30	60	8	30	15	7	6	32	mb	200	64767
TSB type H 60-10/10	60	10	10	15	8	6	32	mb	200	64768
TSB type H 60-10/15	60	10	15	15	8	6	39	mb	200	64769
TSB type H 60-10/20	60	10	20	15	8	6	39	mb	200	64770
TSB type H 60-10/25	60	10	25	15	8	6	39	mb	200	64771
TSB type H 60-10/30	60	10	30	15	8	6	39	mb	200	64772
TSB type H 80-8/10	80	8	10	15	7	6	32	mb	150pcs.=187,5m	64773
TSB type H 80-8/15	80	8	15	15	7	6	32	mb	150	64774
TSB type H 80-8/20	80	8	20	15	7	6	32	mb	150	64775
TSB type H 80-8/25	80	8	25	15	7	6	32	mb	150	64776
TSB type H 80-8/30	80	8	30	15	7	6	32	mb	150	64777
TSB type H 80-10/10	80	10	10	15	8	6	39	mb	150	64778
TSB type H 80-10/15	80	10	15	15	8	6	39	mb	150	64779
TSB type H 80-10/20	80	10	20	15	8	6	39	mb	150	64780
TSB type H 80-10/25	80	10	25	15	8	6	39	mb	150	64781
TSB type H 80-10/30	80	10	30	15	8	6	39	mb	150	64782
TSB type H 80-12/10	80	12	10	15	9,5	8	39	mb	150	64783
TSB type H 80-12/15	80	12	15	15	9,5	8	46	mb	150	64784
TSB type H 80-12/20	80	12	20	15	9,5	8	46	mb	150	64785
TSB type H 80-12/25	80	12	25	15	9,5	8	46	mb	150	64786
TSB type H 80-12/30	80	12	30	15	9,5	8	46	mb	150	64787
TSB type 2H 110-12/15	110	12	15	15	9,5	9	43	mb	80	64788

**TOOLS**

	Name	Packaging [pcs.]	Weight [kg/pcs]	Art.no.
	Pipe-shaped ferrule with a latch for bending the reinforcement bars	1	1,18	ZB-ZO-CS-0-02568
	Bar bending ferrule of the 'console' type. For rails with a maximum width up to 190mm	1	3,10	ZB-ZO-CS-0-05611

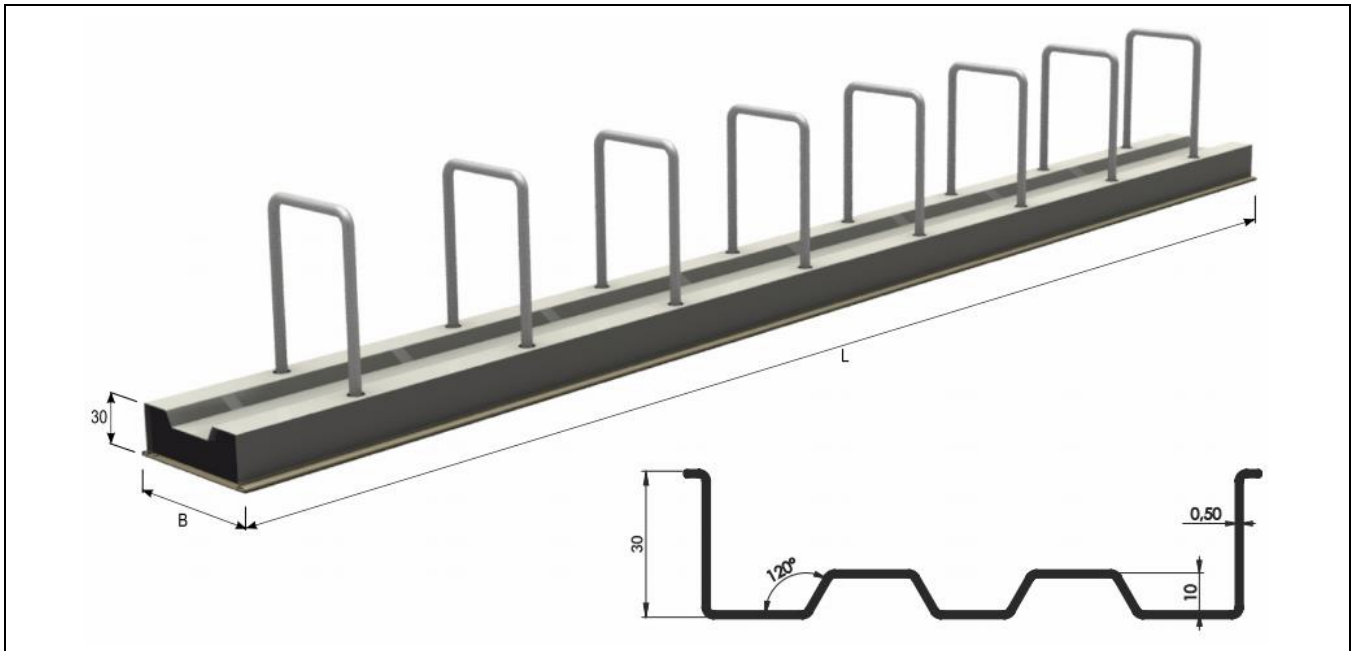
**TERWA STARTER BOX – TYPE TP**


- Standard rail length L=1,25 M
- Cross-profiled sheet steel for optimum force transmission

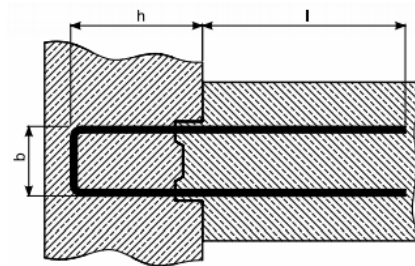


Symbol	Rail width B [mm]	Bar diameter $\phi$ [mm]	Bar spacing E [cm]	h [cm]	b [cm]	l [cm]	Measurement Unit	Packaging [pcs/palette]	Art. No.
<b>TSB – type TP</b>									
TSB type TP 110-10/15	110	10	15	15	9	39	mb	80pcs.=100m	64789
TSB type TP 110-10/20	110	10	20	15	9	39	mb	80	64790
TSB type TP 140-10/15	140	10	15	15	12	39	mb	108pcs.=135m	64791
TSB type TP 140-10/20	140	10	20	15	12	39	mb	108	64792
TSB type TP 140-12/15	140	12	15	15	12	46	mb	108	64793
TSB type TP 140-12/20	140	12	20	15	12	46	mb	108	64794
TSB type TP 160-10/15	160	10	15	15	14	39	mb	84pcs.=105m	64795
TSB type TP 160-10/20	160	10	20	15	14	39	mb	84	64796
TSB type TP 160-12/15	160	12	15	15	14	46	mb	84	64797
TSB type TP 160-12/20	160	12	20	15	14	46	mb	84	64798
TSB type TP 190-10/15	190	10	15	15	17	39	mb	72pcs.=90m	64799
TSB type TP 190-10/20	190	10	20	15	17	39	mb	72	64800
TSB type TP 190-12/15	190	12	15	15	17	46	mb	72	64801
TSB type TP 190-12/20	190	12	20	15	17	46	mb	72	64802



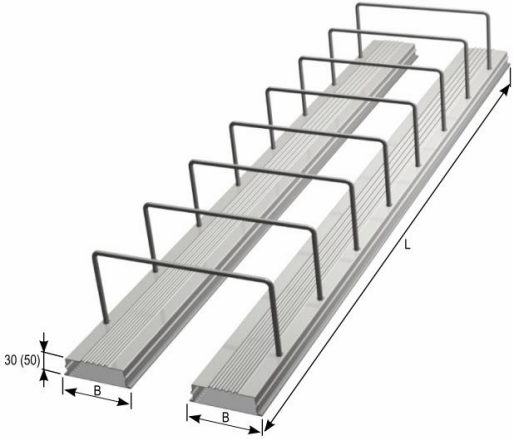
**TERWA STARTER BOX – TYPE TW**


- Standard rail length L=1,25 M
- Cross-profiled sheet steel for optimum force transmission

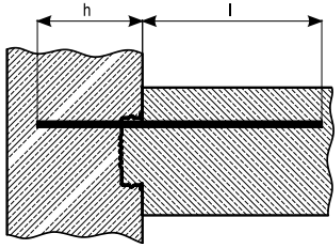
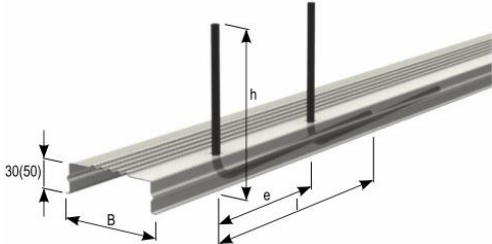
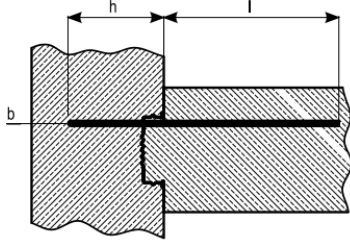
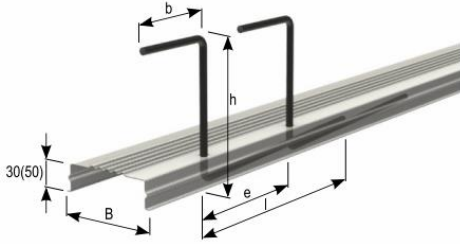
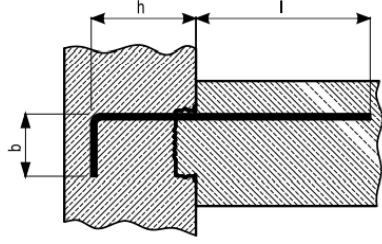
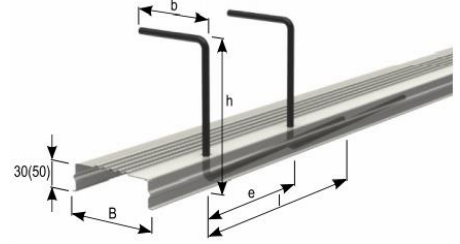


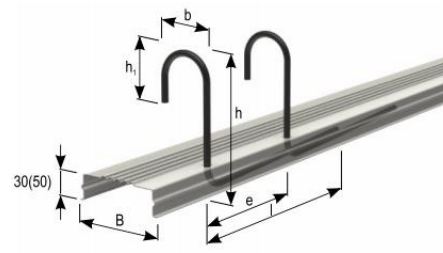
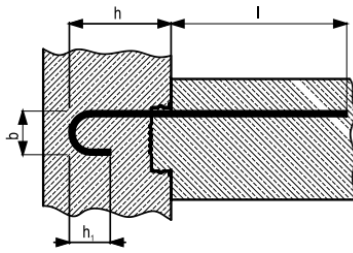
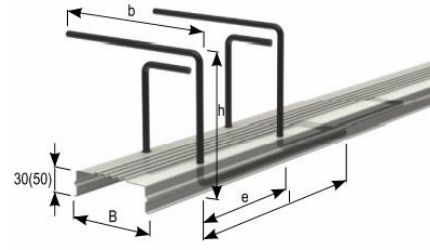
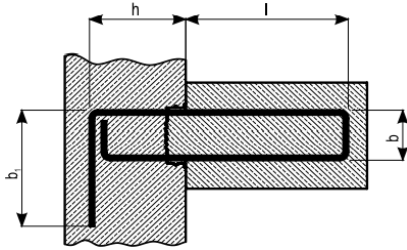
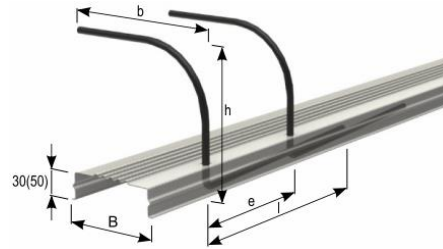
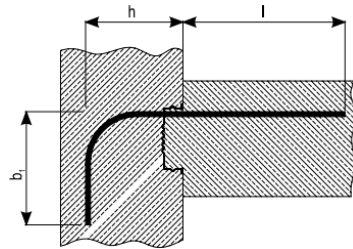
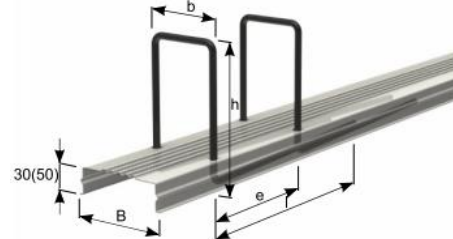
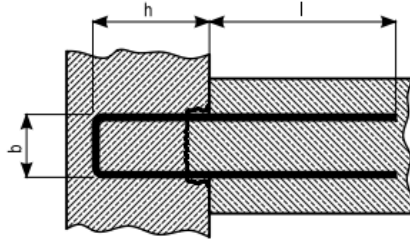
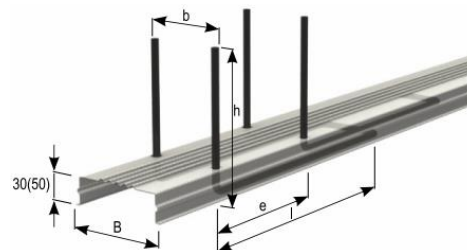
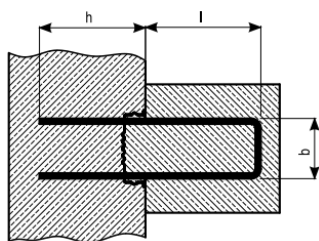
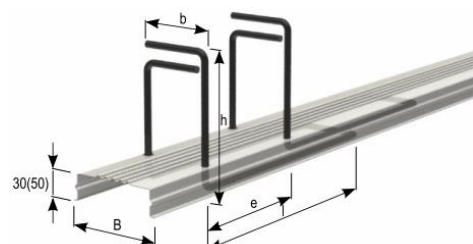
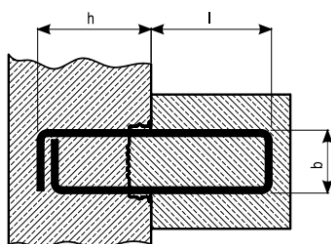
Symbol	Rail width B [mm]	Bar diameter $\phi$ [mm]	Bar spacing E [cm]	h [cm]	b [cm]	l [cm]	Measurement Unit	Packaging [pcs/palette]	Art. No.
<b>TSB – type TP</b>									
TSB type TW 110-10/15	110	10	15	15	9	39	mb	80pcs.=100m	64803
TSB type TW 110-10/20	110	10	20	15	9	39	mb	80	64804
TSB type TW 140-10/15	140	10	15	15	12	39	mb	108pcs.=135m	64805
TSB type TW 140-10/20	140	10	20	15	12	39	mb	108	64806
TSB type TW 140-12/15	140	12	15	15	12	46	mb	108	64807
TSB type TW 140-12/20	140	12	20	15	12	46	mb	108	64808
TSB type TW 160-10/15	160	10	15	15	14	39	mb	84pcs.=105m	64809
TSB type TW 160-10/20	160	10	20	15	14	39	mb	84	64810
TSB type TW 160-12/15	160	12	15	15	14	46	mb	84	64811
TSB type TW 160-12/20	160	12	20	15	14	46	mb	84	64812
TSB type TW 190-10/15	190	10	15	15	17	39	mb	72pcs.=90m	64813
TSB type TW 190-10/20	190	10	20	15	17	39	mb	72	64814
TSB type TW 190-12/15	190	12	15	15	17	46	mb	72	64815
TSB type TW 190-12/20	190	12	20	15	17	46	mb	72	64816

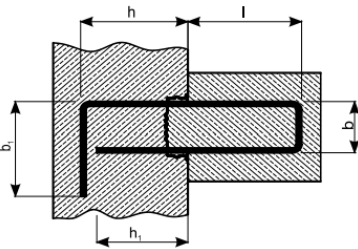
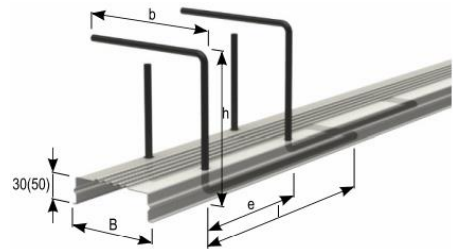
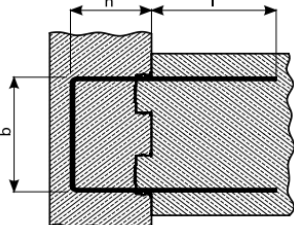
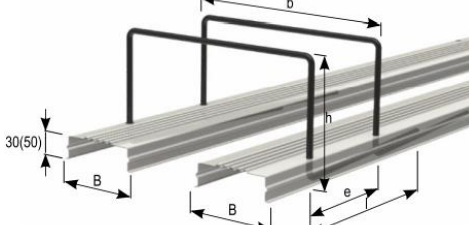
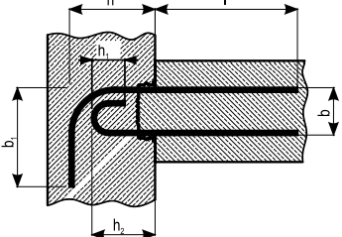
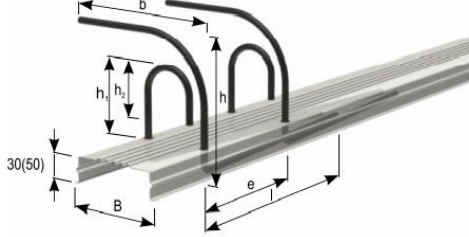
### NON-STANDARD COMPONENTS

	<p>TERWA Starter Box reinforcement system in the non-standard versions:</p> <p>Component length - 1,25 m; other lengths upon request</p> <ul style="list-style-type: none"> <li>• Rail width: 60, 80, 110, 140, 160, 190, 220, 240 mm</li> <li>• Reinforcement bar diameter: 8, 10, 12, 14, 16 mm</li> <li>• Rail bar spacing: 10, 15, 20, 25, 30 cm; other spacing distances available upon request</li> <li>• Loop width must be lower than the width of the reinforced component by at least 2 cm</li> <li>• Possibility of increasing thickness of the rail allows performance cavity bigger than 30 mm</li> </ul>
<p>Fig. BINDAX type B. Broad joint using two rails</p>	<p><b>Designation examples:</b></p> <p>STARTER BOX – <b>N</b>, typ KO <b>160</b> - <b>10</b> / <b>20</b></p> <p style="text-align: center;"> <span style="margin-right: 100px;">Non-standard components</span> <span style="margin-right: 50px;">rail width</span> <span style="margin-right: 50px;">bar diameter</span> <span>bar spacing</span> </p> <p>H= 15cm, b= 14cm, l= 48cm</p>

### NON-STANDARD BAR TYPES



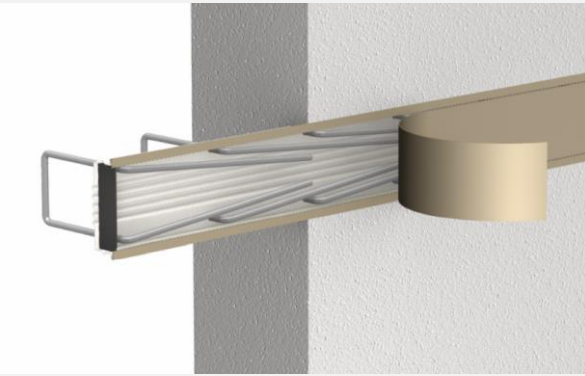
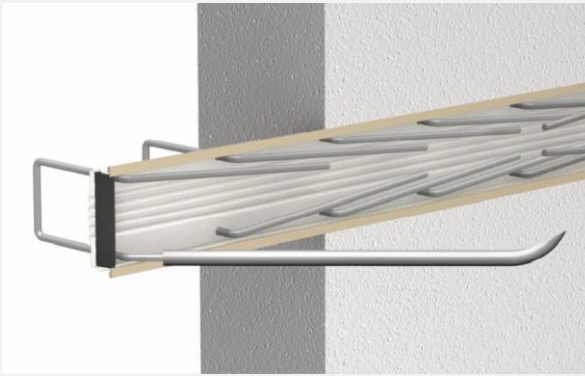
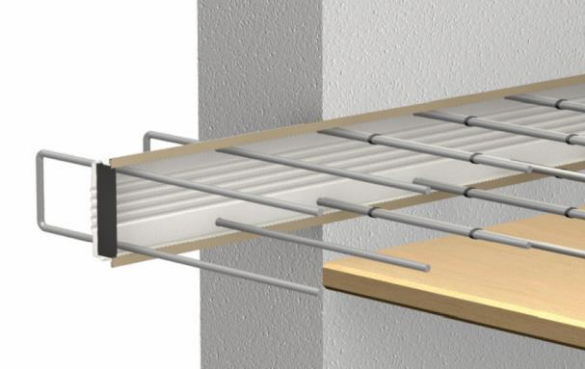
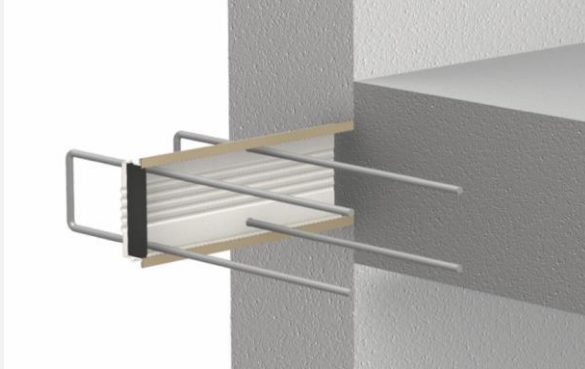
<p><b>Type W: Single bar, perpendicular to the rail</b></p>	
	
<p><b>Type WH: Single bar bent by 90°. Bends placed along rail</b></p>	
	
<p><b>Type WS: Single bar bent by 90°</b></p>	
	

**Type H: As in the standard version. Bends placed crosswise with respect rail. Width - 60 or 80 mm. Single-row variant**

**Type BK: Symmetric 'console'-type loop. Closed loop. Available versions for the following loop spacings: 90, 120, 140, 170, 200, 220mm.**

**Type BA: Arch allowing deep anchoring**

**Type S: Symmetric loop**

**Type KO: Symmetric 'console'-type loop. Open loop**

**Type K: Closed loop. Minimal size b=90 mm**


Type KH: Semi-open loop	
 <p>Diagram showing the cross-section of a semi-open loop. Dimensions include: <math>h</math> (loop height), <math>l</math> (loop length), <math>b_1</math> (left rail width), <math>b_2</math> (right rail width), and <math>h_1</math> (left rail height).</p>	 <p>3D perspective view of the semi-open loop installed on two parallel rails. Dimensions include: <math>b</math> (loop width), <math>h</math> (loop height), <math>30(50)</math> (rail height), <math>B</math> (rail width), and <math>e</math> (loop offset).</p>
Type B: Symmetric loop installed in two parallel rails	
 <p>Diagram showing the cross-section of a symmetric loop. Dimensions include: <math>h</math> (loop height), <math>l</math> (loop length), and <math>b</math> (loop width).</p>	 <p>3D perspective view of the symmetric loop installed in two parallel rails. Dimensions include: <math>b</math> (loop width), <math>h</math> (loop height), <math>30(50)</math> (rail height), <math>B</math> (rail width), and <math>e</math> (loop offset).</p>
Type BA+H: Arch with single or dual rail	
 <p>Diagram showing the cross-section of an arch. Dimensions include: <math>h</math> (arch height), <math>l</math> (arch length), <math>b_1</math> (left rail width), <math>b_2</math> (right rail width), <math>h_1</math> (left rail height), and <math>h_2</math> (right rail height).</p>	 <p>3D perspective view of the arch installed on a single or dual rail. Dimensions include: <math>b</math> (arch width), <math>h</math> (arch height), <math>h_1</math> (left rail height), <math>h_2</math> (right rail height), <math>30(50)</math> (rail height), <math>B</math> (rail width), and <math>e</math> (loop offset).</p>



## ASSEMBLY INSTRUCTIONS

<p><b>1. Nailing the starter box rail to the formwork</b></p> 	<p><b>2. Concreting the element</b></p> 
<p><b>3. After removal of the formwork from the concreted component, tear away the protective film along the incisions</b></p> 	<p><b>4. Bend away bars using the special pipe-shaped bending component or the grip ferrule. Avoid having to bend bars again</b></p> 
<p><b>5. The bendable bars are ready for joining with further reinforcement bars</b></p> 	<p><b>6. View of joints of two elements</b></p> 

### Additional remarks

- Before concreting the TERWA Starter Box bendable reinforcement bar system, the location of the component rebar needs to be inspected so as to maintain the required anchor lengths and bar overlay values. The 'h' dimension, or the section anchored in the first stage is calculated from the formwork face.
- Welding the bars in the bending area can negatively influence the properties of the steel, hence, it should be avoided. In the other sections, it should be executed at the responsibility of the contractor.
- The TERWA Starter Box reinforcement bar load bearing capacity is lower by approx. 20% due to bending to fit the profiles and then bending away. Hence, reinforcement bars should be bent only once. Do not carry out bending in an ambient temperature below 15°C.

## CONTACT



TERWA is the global supplier for precast and construction solutions with multiple offices around the world. With all our staff, partners and agents, we are happy to provide all construction and precast companies who work in the building industry with full service and 100% support.

### TERWA CONSTRUCTION GROUP

#### Terwa Construction Netherlands (HQ)

**Global Sales & Distribution**  
 Kamerlingh Onneslaan 1-3  
 3401 MZ IJsselstein  
 The Netherlands  
**T** +31-(0)30 699 13 29  
**F** +31-(0)30 220 10 77  
**E** [info@terwa.com](mailto:info@terwa.com)

#### Terwa Construction Central East Europe

**Sales & Distribution**  
 Strada Sânzieni  
 507075 Ghimbav  
 Romania  
**T** +40 372 611 576  
**E** [info@terwa.com](mailto:info@terwa.com)

#### Terwa Construction Poland

**Sales & Distribution**  
 Ul. Cicha 5 lok. 4  
 00-353 Warszawa  
 Poland  
**E** [info@terwa.com](mailto:info@terwa.com)

#### Terwa Construction India & Middle East

**Sales & Distribution**  
 India  
**T** +91 89 687 000 41  
**E** [info@terwa.com](mailto:info@terwa.com)

#### Terwa Construction China

**Sales & distribution**  
 B05, 5F, No. 107, 2nd of the South  
 Zhongshan Road  
 200032 Shanghai  
 China  
**E** [info@terwa.com](mailto:info@terwa.com)

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