



Earthing System



Lightning Protection System



Solar System



Exothermic Welding System



Cathodic Protection System





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## Lightning Protection System

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## Solar System

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## Cathodic Protection System

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# Tavan Gostaran Zino



**Tavan Gostaran Zino Co.** has been established as a specialized company, taking advantage of the modern sciences with the aim of designing, production (supplement), and installation of the following items:

- Electrical and Instrumentation
- Earthing system
- Lightning protection
- Cathodic protection (corrosion control)
- New energies systems (Solar systems)

By relying on its 20-year experience since its establishment, human resources and knowledge of its engineers and experts, and by transferring of modern technologies and methods and their employment, **Tavan Gostaran Zino Co.** has received a considerable growth in implementing EPC work in various industries including oil, gas, petrochemical, refineries, power plants, and electricity posts.







## Engineering Service Range

### Earthing and Lightning Protection Systems

#### 1. Site Survey

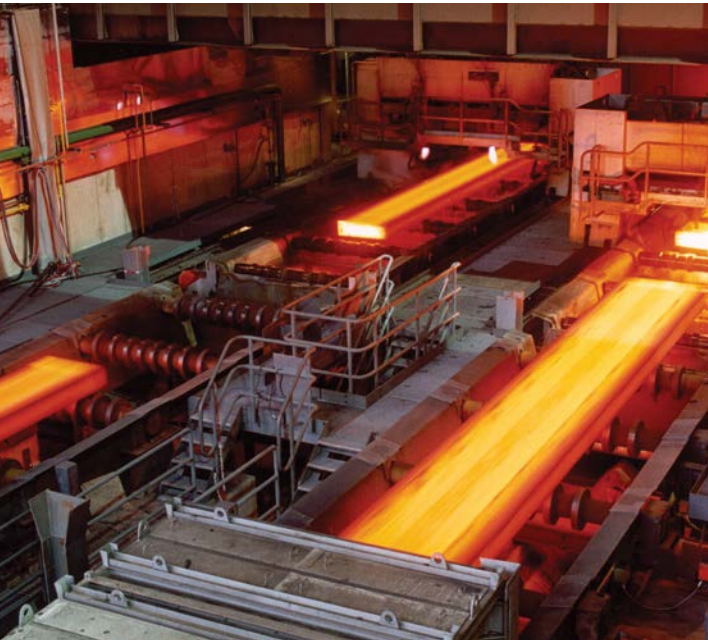
- 1.1. Soil study
  - 1.1.1. Soil resistivity test (Wenner Four-Electrode Method)
  - 1.1.2. Soil pH test
- 1.2. Lightning rod installation survey
- 1.3. Lightning protection level and method survey

#### 2. Designing

Designing is done according to the documented standards and procedures in the system and relevant to the received information from section 1, as well as the existing maps in the system designing with the lowest cost and the best performance. At this point, the initial plan for the installation, running, and implementation, and the calculation tables are also suggested.

#### 3. Post-Implementation Survey

1. Earth resistance system survey using 62% method, Slope method and etc.
2. Voltage contact detection
3. Voltage pitch survey
4. Continuity testing of ground and lightning protection systems
- 5- Leak testing









# Exothermic Welding System



## The Exothermic Weld Process

Exothermic welding is a cost efficient method of making large or small numbers of high quality electrical connections. It is a simple, self-contained system that uses the high temperature reaction of powdered copper oxide and aluminium, within a mould, to form permanent electrical connections.

### Typical applications include:

- Earthing for power plants and substations
- Telecommunications
- Transmission and power distribution lines
- Cathodic protection
- Rail connections



### The Exothermic weld system:

- requires no external power or heat source
- creates high quality electrical connections
- is completely portable
- can be used safely with minimum training
- is cost effective
- can be used for over 70 standard connection configurations

### The Exothermic weld connection

Exothermic weld connections have several advantages:

- tolerant to repeated fault currents
- highly conductive
- do not loosen
- excellent corrosion resistance

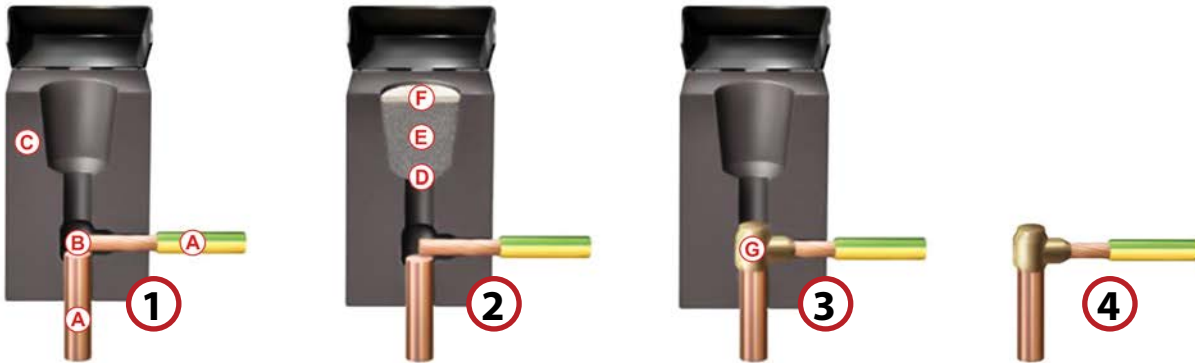
Most Exothermic weld connections have at least twice the cross-sectional area of the conductors being joined, and an equivalent or greater current carrying capacity. Corrosion resistance is exceptional because of the very high copper content (> 90%) of the alloy.





## Making a Exothermic weld joint is a simple procedure as illustrated below

1. Locate the conductors (A) to be joined in the weld cavity (B) and close the mould (C).
2. Locate the steel retaining disc in the base of the crucible (D). Pour in the weld powder (E) followed by the starting powder (F). Ignite starting powder with a spark gun.
3. The resulting exothermic reaction reduces the weld powder to molten copper alloy which melts the retaining disc and flows into the weld cavity where it partially melts the conductors (G).
4. The molten copper alloy cools to leave a fusion weld of great mechanical and electrical integrity.



The Exothermic weld moulds are made of a heat-resistant semipermanent graphite

They comprise a crucible, tap hole and a weld cavity.

The high temperature thermic reaction takes place in the crucible of the moulds allowing molten copper to flow through the tap hole into the weld cavity, producing a solid joint.

They can be used for over than 70 connections under normal usage.

Graphite cover protects from the reaction projections.



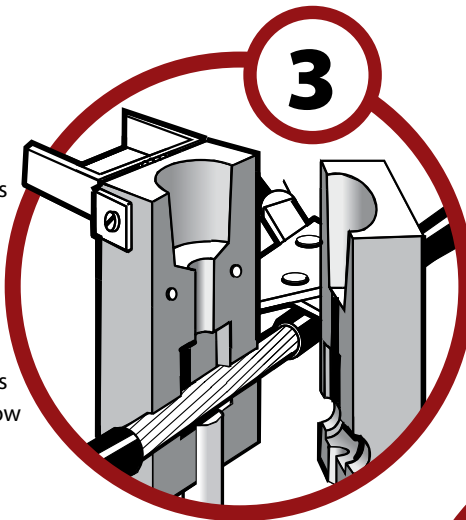




Remove the isolation of the conductor on a length of 15 cm when using insulated cable. Using the cardcloth-brush, brush the cable and the rod end to remove all dust and oxydes.



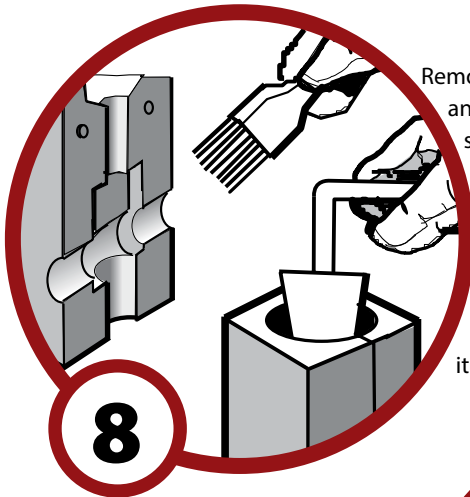
Before starting the first weld preheat the graphite mould with a welding torch during at least 5 minutes. This operation is very important because moisture in moulds will cause a porous weld.



Open the mould by separating the two arms of the handle clamp. Cable must sit on top of rod. Support mould to keep it from sliding down the rod when welding. Use lock pliers or clamp on rod below mould.

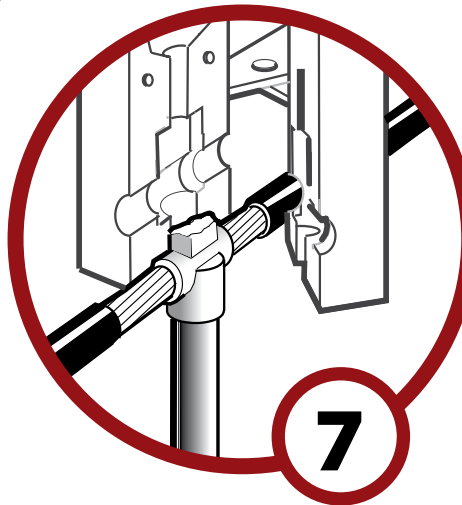


Close securely the mould with the handle clamp to avoid molten metal losses. Place the metallic disc, conical side to bottom, on tap hole.



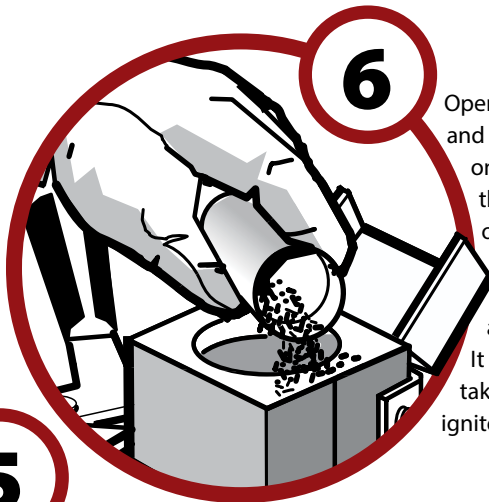
Remove slag from the crucible and tap hole with the mould scraper. Remove dust from the weld cavity, tap hole, crucible and mould cover with the mould brush. If the mould is still warm, you can go on the welding process without pre-heating it again.

**8**



Wait one minute and open completely the mould handle clamp to remove the welded connection. During this operation take care of your graphite mould.

**7**



Open black cover of the cartridge and spread all the starting powder on the welding powder and on the top edge of the mould, under open cover, for easy ignition. Close the mould cover and placing the flint igniter from aside ignite the starting powder. It is advisable, once the ignition takes place, to pull iaway the flint igniter quickly to avoid its damage.

**6**



Open coloured cover of the cartridge size shown on the mould tag and pour the aluminothermic powder into the crucible.

**5**





## Accessories For Exothermic Weld

### Handle Clamps

They are designed to handle the moulds allowing to open and close them safely.

There are different types of handle clamps depending on the mould size and shape



### Cartridges And Discs

Each plastic container holds the aluminothermic powder at one end (coloured cover) and the starting powder at the other one (black cover). Close the tap hole with the metallic disc before to dump the aluminothermic powder into the crucible.



### Flint Igniter

It is designed for easy ignition starting powder is used. And replaces the standard are an excellent fit for the job.



### Hard Wire Brush

It is used for cleaning the conductors before making the weld.



### Mould Brush

It is recommended to safely cleaning the inner part of the mould after every weld.



### Mould Scrapers

its shape fits the crucible to easy remove the slag and to check tap hole clearance after making every weld





## Weld Powders

Cu-Connect Weld Metal is a high quality mixture of copper oxide and aluminium, contained inside plastic cartridges which are packed in boxes of 10 or 20 pieces depending on the powder weight. The metal retaining discs are contained in a separate bag inside each box. Each weld connection uses one disc.

The starting powder is compacted at the bottom of each cartridge with the Weld Metal on top. The starting powder is released by firmly tapping the base of the cartridge.

Cu-Connect Weld Powder is not explosive, shock sensitive or subject to spontaneous ignition.

Description	Part Number	Box Quantity
32 gr welding powder	ZWP 032	30 No.s
45 gr welding powder	ZWP 045	
65 gr welding powder	ZWP 065	
90 gr welding powder	ZWP 090	15 No.s
115 gr welding powder	ZWP 115	
150 gr welding powder	ZWP 150	
200 gr welding powder	ZWP 200	10 No.s
250 gr welding powder	ZWP 250	



## Metal Disks

## Quick Starter



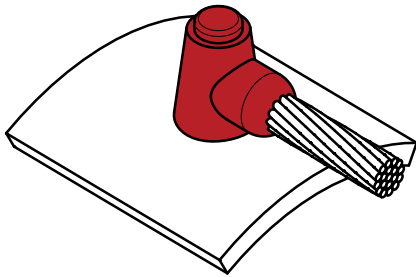
The disk rests on the bottom of the crucible and hold the welding powder in place until the reaction takes place. For each weld made, a new disk is required. Disks are included with the weld material.

A way to start weld metal is using of wick. It is also used for igniting of exothermic welding powder in smokeless moulds.





## Types of connections



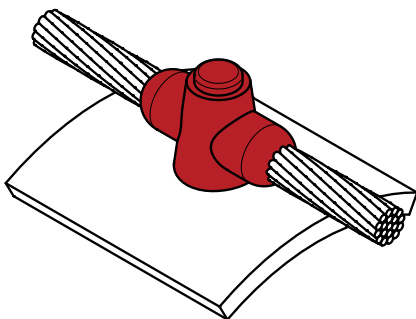
### Cable to Steel PIPE Connection

Part No. ZCEP

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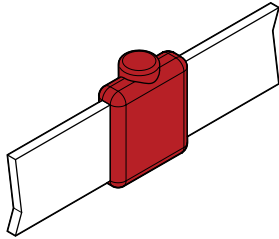
### Cable to Steel PIPE Connection Run Type

Part No. ZCPP

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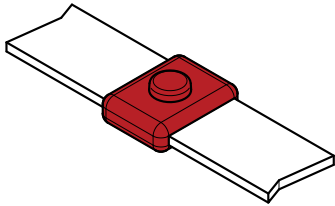
## Tape To Tape Connection - Straight Type - Vertical

Part No. ZTST-V

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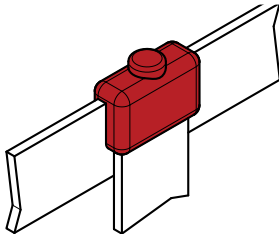
## Tape To Tape Connection - Straight Type - Horizontal

Part No. ZTST-H

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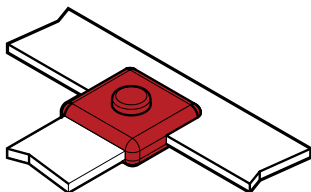
## Tape to Tape Connection - "T" Type Vertical

Part No. ZTTT-V

Special Custom

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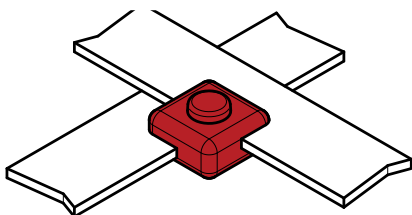
## Tape to Tape Connection - "T" Type Horizontal

Part No. ZTTT-H

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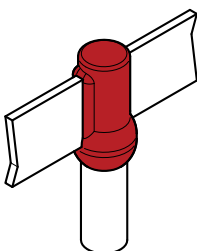
## Tape to Tape Connection - Cross Type

Part No. ZTXT

Special Custom

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## Tape to Rod Connection - "T" Type Vertical

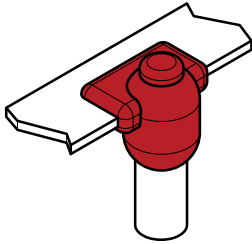
Part No. ZTTR-V

Special Custom

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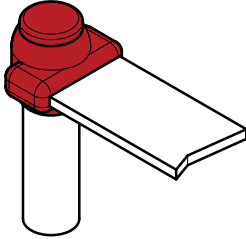
## Tape to Rod Connection –“T” Type Horizontal

Part No. ZTTR-H

Special Custom

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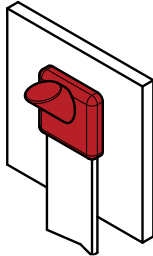
## Tape to Rod Connection –“L” Type

Part No. ZTER

Special Custom

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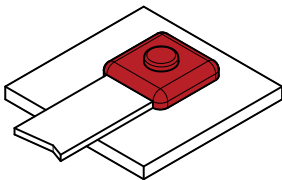
## Tape to Steel Surface Connection - Upwards Type

Part No. ZTUS

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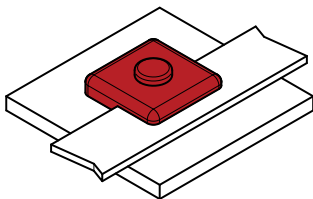
## Tape to Steel Surface connection

Part No. ZTER

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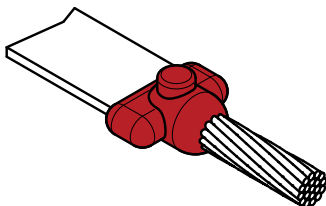
## Tape to Steel Surface connection - Run Type

Part No. ZTRP

Special Custom

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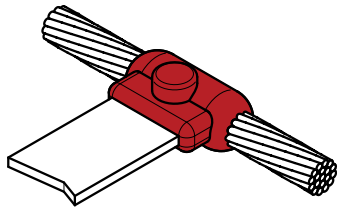
## Cable to Tape connection - Straight Type

Part No. ZTSC

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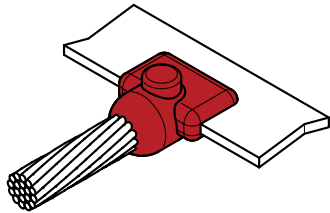
## Tape to Cable Connection - "T" Type

Part No. ZCTT

Special Custom

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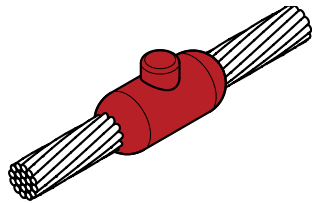
## Cable to Tape Connection - "T" Type

Part No. ZTTC

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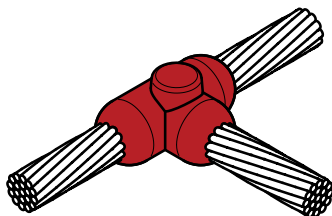
## Cable to Cable Connection Straight Type

Part No. ZCSC

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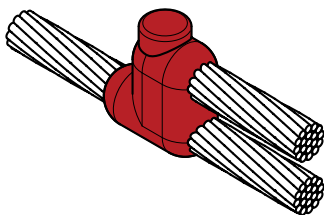
## Cable to Cable Connection - "T" Type

Part No. ZCTC

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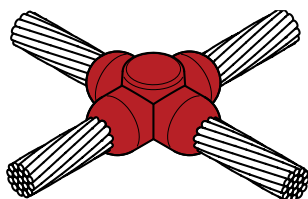
## Cable to Cable Connection - "V" Type

Part No. ZCVC

Special Custom

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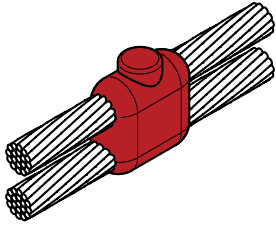
## Cable to Cable Connection - Interapted Cross Type

Part No. ZCCC

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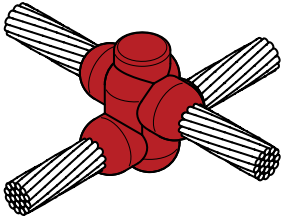
## Cable to Cable Connection - Parallel Type - Vertical

Part No. ZCPC

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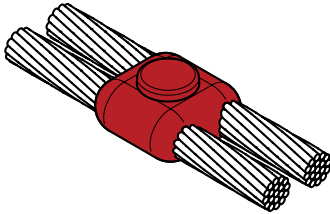
## Cable to Cable Connection - Pushing cross Type

Part No. ZCXC

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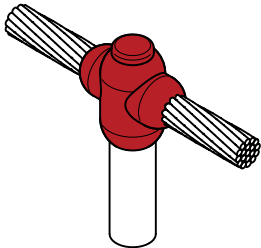
## Cable to Cable Connection - Parallel Type - Horizontal

Part No. ZCWC

Special Custom

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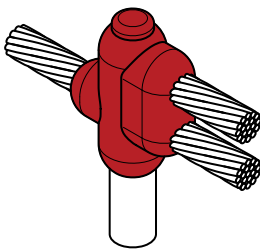
## Cable to Rod Connection - "T" Connection

Part No. ZCTR

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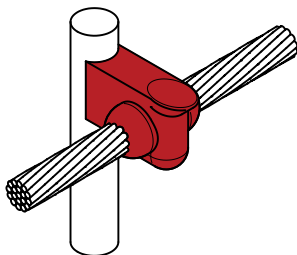
## Three Cable to Rod - "T" Connection

Part No. ZCVR

Special Custom

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## Cable to Rod Connection - Cross Type

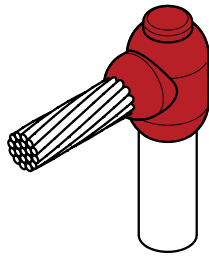
Part No. ZCSR

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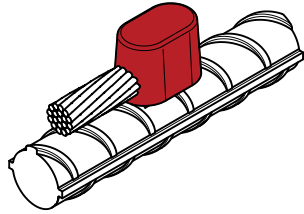
## Cable to Rod Connection - "L" Type

Part No. ZCLR

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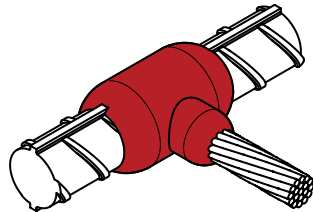
## Cable to Reinforcing Rebar Connection

Part No. ZASC

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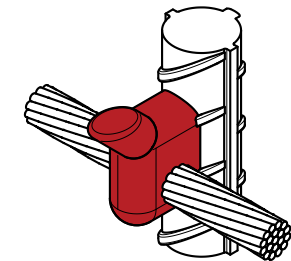
## Cable to Reinforcing Rebar Connection - "T" Type

Part No. ZATC

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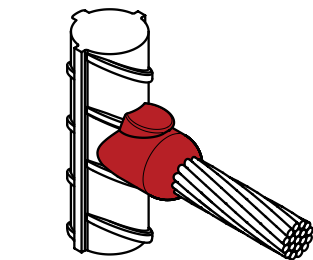
## Cable to Reinforcing Rebar Connection - Cross Type

Part No. ZAXC

Special Custom

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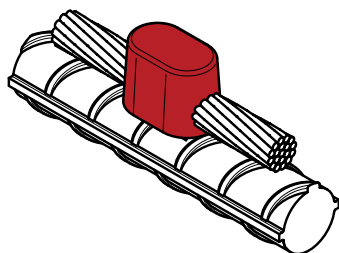
## Cable to Reinforcing Rebar Connection - "L" Type

Part No. ZALC

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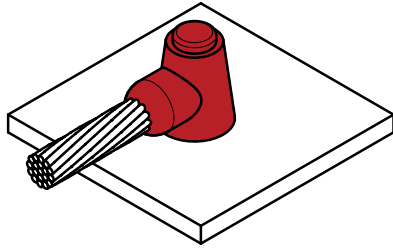
## Cable to Reinforcing Rebar Connection - Parallel Type

Part No. ZAPC

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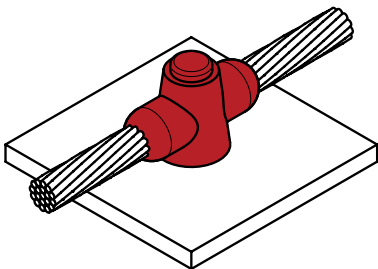
## Cable to Steel Surface Connection

Part No. ZCES

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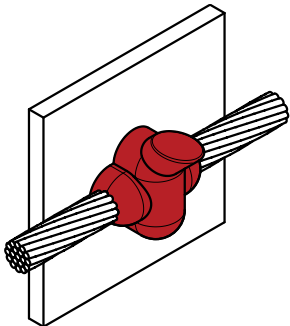
## Cable to Steel Surface Horizontal Connection - Run Type

Part No. ZCPS-H

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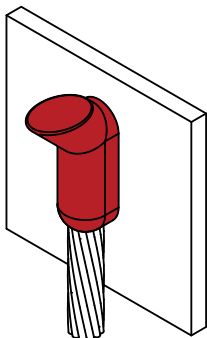
## Cable to Steel Surface Vertical Connection - Run Type

Part No. ZCPS-V

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## Cable to Steel Surface Vertical Connection - Upwards Type

Part No. ZCUS

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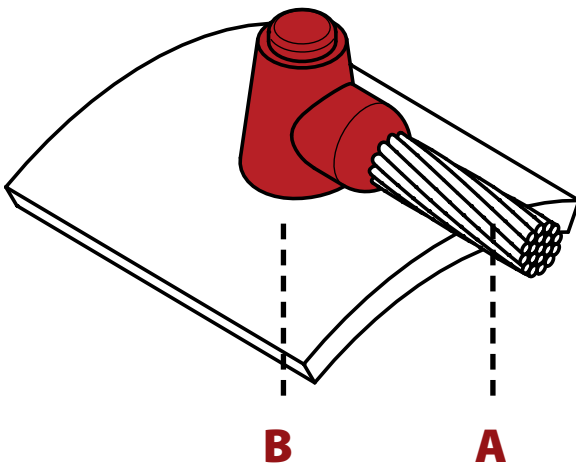


## Rutin Connections Details



Zino company to easily select the appropriate connection and you need the following tables is available to you  
 You can use these tables, molds, powder, suitable handhold select your connection

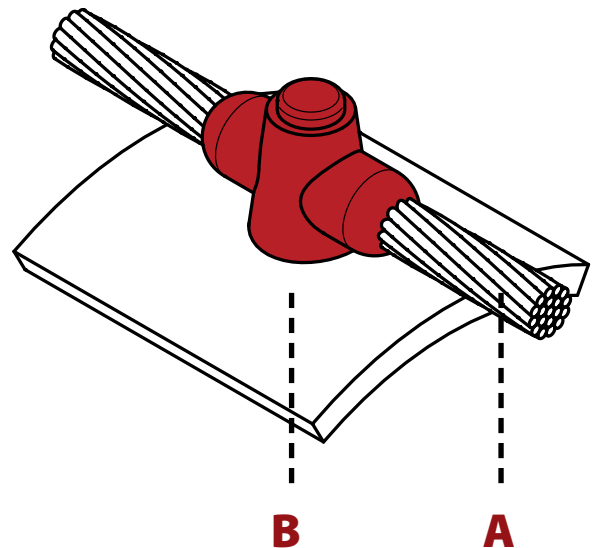
## Cable to Steel PIPE Connection



A	B	Handel Clamp	Mould Type	Powder
16	PIPE Variable	ZHCS	ZCEP 16	ZWP 032
25			ZCEP 25	
35			ZCEP 35	
50			ZCEP 50	ZWP 045
70			ZCEP 70	ZWP 065
95			ZCEP 95	ZWP 115

## Cable to Steel PIPE Connection Run Type

A	B	Handel Clamp	Mould Type	Powder
16	PIPE Variable	ZHC 60	ZCPP 16	ZWP 115
25			ZCPP 25	
35			ZCPP 35	
50		ZHC 80	ZCPP 50	ZWP 150
70			ZCPP 70	ZWP 150
95			ZCPP 95	ZWP 150

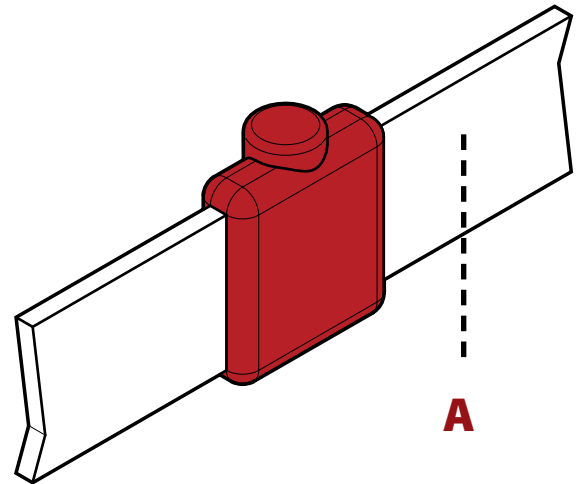






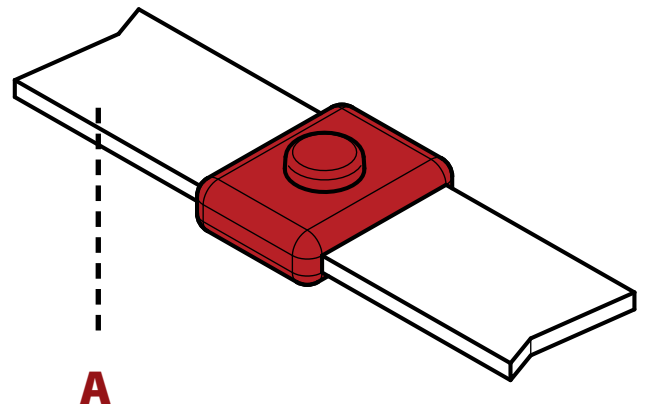
## Tape To Tape Connection - Straight Type - Vertical

A	Handel Clamp	Mould Type	Powder
20x3	ZHC 80	ZTST-V 203	ZWP 065
25x3		ZTST-V 253	
25x5		ZTST-V 255	ZWP 090
30x3		ZTST-V 303	ZWP 090
30x5		ZTST-V 305	ZWP 115
40x3		ZTST-V 403	ZWP 115
40x5		ZTST-V 405	ZWP 150
40x10		ZTST-V 4010	ZWP 250



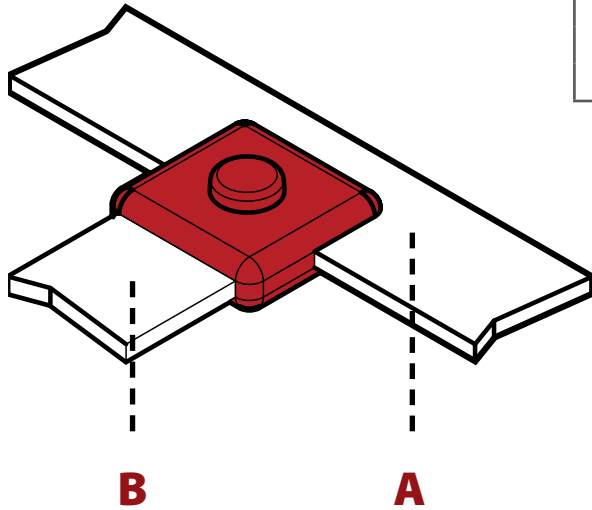
## Tape To Tape Connection - Straight Type - Horizontal

A	Handel Clamp	Mould Type	Powder
20x3	ZHC 80	ZTST-H 203	ZWP 065
25x3		ZTST-H 253	
25x5		ZTST-H 255	ZWP 090
30x3		ZTST-H 303	ZWP 065
30x5		ZTST-H 305	ZWP 115
40x3		ZTST-H 403	ZWP 090
40x5		ZTST-H 405	ZWP 150
40x10		ZTST-H 4010	2 x ZWP 150



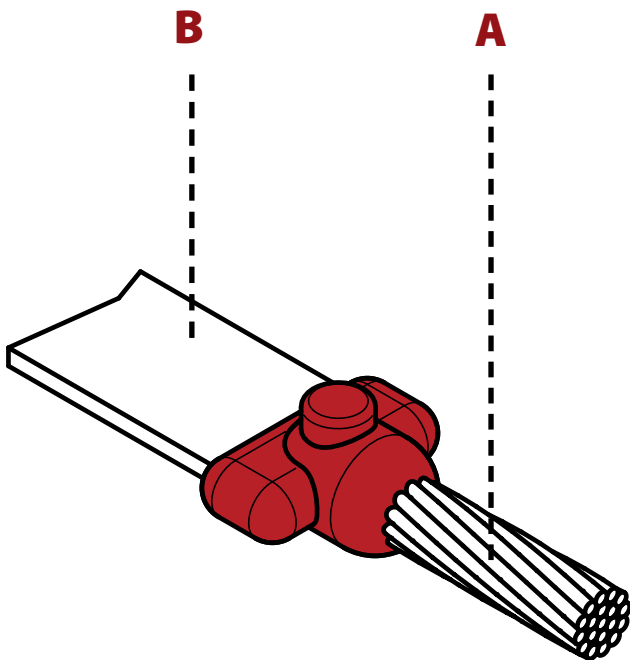


## Tape to Tape Connection – "T" Type Horizontal



A	B	Handel Clamp	Mould Type	Powder
Variable Size	20x3	ZHC 80	ZTTT-H 203	ZWP 090
	25x3		ZTTT-H 253	
	25x5		ZTTT-H 255	ZWP 090
	30x3		ZTTT-H 303	
	30x5		ZTTT-H 305	ZWP 115
	40x5		ZTTT-H 405	ZWP 150

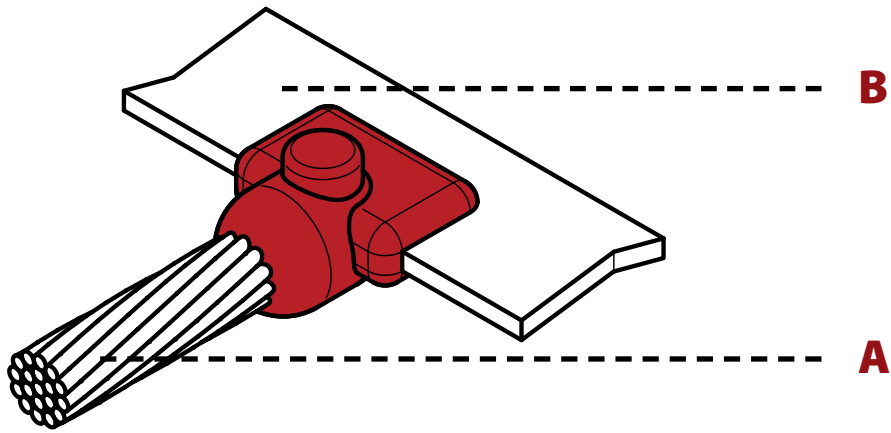
## Cable to Tape connection - Straight Type



A	B	Handel Clamp	Mould Type	Powder
16	20x3	ZHC 80	ZTSC 16203	ZWP 065
25	25x3		ZTSC 16253	
35	25x5		ZTSC 35255	ZWP 090
50	30x3		ZTSC 50303	ZWP 115
70	30x5		ZTSC 70305	
95	40x5		ZTSC 95405	ZWP 150
120	25x5		ZTSC 120255	ZWP 115
	30x5		ZTSC 120305	ZWP 115
150	25x5		ZTSC 150255	ZWP 150
	30x5		ZTSC 150305	
185	25x5		ZTSC 185255	ZWP 150
	30x5		ZTSC 185305	



## Cable to Tape Connection – "T" Type



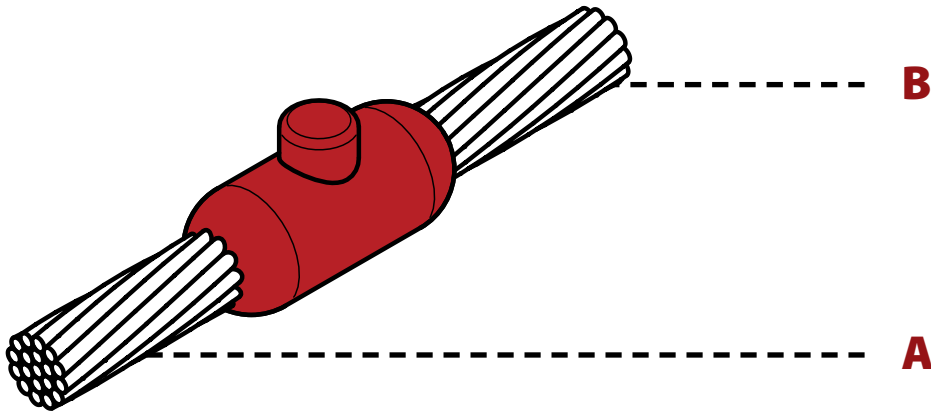
A	B	Handel Clamp	Mould Type	Powder
16	20x3	ZHC 80	ZTTC 16203	ZWP 090
	25x3		ZTTC 16253	
25	20x3	ZHC 80	ZTTC 25203	ZWP 090
	20x5		ZTTC 25205	
	25x3		ZTTC 25253	
35	20x3	ZHC 80	ZTTC 35203	ZWP 090
	20x5		ZTTC 35205	
	25x3		ZTTC 35253	
50	20x3	ZHC 80	ZTTC 50203	ZWP 090
	20x5		ZTTC 50205	
	25x3		ZTTC 50253	
	30x3		ZTTC 50303	
	40x3		ZTTC 50403	
	40x5		ZTTC 50405	
	70		20x3	
20x5	ZTTC 70205			
25x3	ZTTC 70253			
25x5	ZTTC 70255			
30x3	ZTTC 70303			
40x3	ZTTC 70403			
40x5	ZTTC 70405			

A	B	Handel Clamp	Mould Type	Powder
95	20x3	ZHC 80	ZTTC 95203	ZWP 090
	25x3		ZTTC 95253	
	25x5		ZTTC 95255	
	30x3		ZTTC 95303	
	30x5		ZTTC 95305	
	40x5		ZTTC 95405	
50x5	ZTTC 95505			
120	25x3	ZHC 80	ZTTC 120253	ZWP 115
	25x5		ZTTC 120255	
	30x5		ZTTC 120305	
	50x5		ZTTC 120505	
	25x10		ZTTC 120251	ZWP 150
	30x10		ZTTC 120301	
	40x10		ZTTC 120401	





## Cable to Cable Connection Straight Type

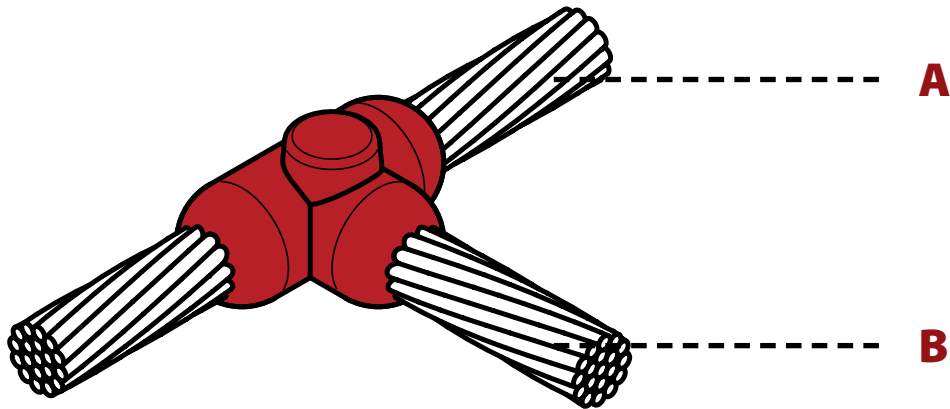


A	B	Handel Clamp	Mould Type	Powder		
16	16	ZHC 60	ZCSC 1616	ZWP 032		
25	16	ZHC 60	ZCSC 2516			
	25		ZCSC 2525			
35	16	ZHC 60	ZCSC 3516	ZWP 045		
	25		ZCSC 3525			
	35		ZCSC 3535			
50	16	ZHC 60	ZCSC 5016	ZWP 045		
	25		ZCSC 5025			
	35		ZCSC 5035			
	50		ZCSC 5050			
70	16	ZHC 60	ZCSC 7016	ZWP 065		
	25		ZCSC 7025			
	35		ZCSC 7035			
	50		ZCSC 7050			
70	70	ZHC 60	ZCSC 7070	ZWP 065		
	95		16		ZCSC 9516	ZWP 065
			25		ZCSC 9525	
			35		ZCSC 9535	
95	50	ZHC 80	ZCSC 9550	ZWP 090		
	70		ZCSC 9570			
	95		ZCSC 9595			
120	16	ZHC 80	ZCSC 12016	ZWP 090		
	25		ZCSC 12025			
	35		ZCSC 12035			
	50		ZCSC 12050	ZWP 115		
	70		ZCSC 12070			
	95		ZCSC 12095			
120	ZCSC 120120					

A	B	Handel Clamp	Mould Type	Powder	
150	50	ZHC 80	ZCSC 15050	ZWP 115	
	70		ZCSC 15070		
	95		ZCSC 15095		
	120		ZCSC 150120		
150	150	ZHC 80	ZCSC 150150	ZWP 115	
	185		50		ZCSC 18550
			70		ZCSC 18570
			95		ZCSC 18595
185	120	ZHC 80	ZCSC 185120	ZWP 150	
	150		ZCSC 185150		
	185		ZCSC 185185		
240	70	ZHC 80	ZCSC 24070	ZWP 150	
	95		ZCSC 24095		
	120		ZCSC 240120	ZWP 200	
	150		ZCSC 240150		
	185		ZCSC 240185		
240	ZCSC 240240				



## Cable to Cable Connection - "T" Type

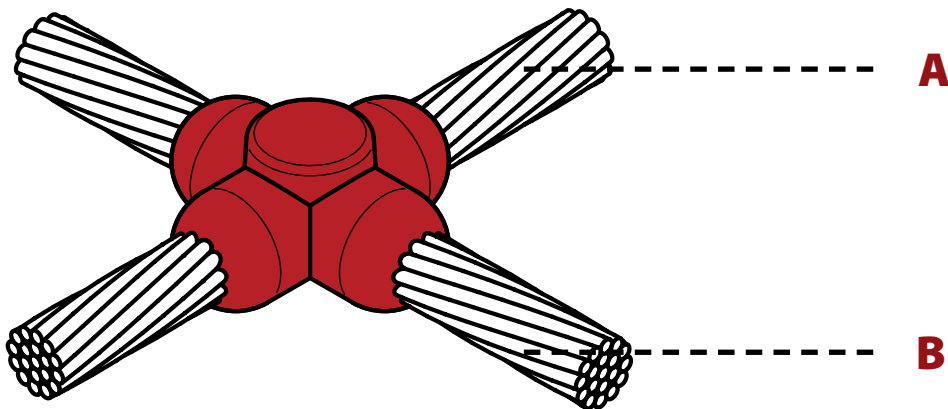


A	B	Handel Clamp	Mould Type	Powder
16	16	ZHC 60	ZCTC 1616	ZWP 045
25	16	ZHC 60	ZCTC 2516	
	25		ZCTC 2525	
35	16	ZHC 60	ZCTC 3516	ZWP 045
	25		ZCTC 3525	
	35		ZCTC 3535	
50	16	ZHC 60	ZCTC 5016	ZWP 065
	25		ZCTC 5025	
	35		ZCTC 5035	ZWP 090
	50		ZCTC 5050	
70	16	ZHC 60	ZCTC 7016	ZWP 065
	25		ZCTC 7025	
	35		ZCTC 7035	
	50		ZCTC 7050	ZWP 090
	70		ZCTC 7070	
	95		ZCTC 7095	
95	16	ZHC 60	ZCTC 9516	ZWP 090
	25		ZCTC 9525	
	35		ZCTC 9535	
	50		ZCTC 9550	
	70		ZCTC 9570	ZWP 115
	95		ZCTC 9595	
	120		ZCTC 95120	
120	16	ZHC 60	ZCTC 12016	ZWP 090
	25		ZCTC 12025	
	35		ZCTC 12035	
	50		ZCTC 12050	
	70		ZCTC 12070	
	95		ZCTC 12095	
	120	ZHC 80	ZCTC 120120	ZWP 150

A	B	Handel Clamp	Mould Type	Powder
150	16	ZHC 80	ZCTC 15016	ZWP 115
	25		ZCTC 15025	
	35		ZCTC 15035	
	50		ZCTC 15050	
	70		ZCTC 15070	ZWP 150
	95		ZCTC 15095	
	120		ZCTC 150120	
	150		ZCTC 150150	
185	185	ZHC 80	ZCTC 150185	ZWP 200
	16		ZCTC 18516	ZWP 115
	25		ZCTC 18525	
	35		ZCTC 18535	
	50		ZCTC 18550	
	70		ZCTC 18570	ZWP 150
95	ZCTC 18595			
120	ZCTC 185120			
240	150	ZHC 80	ZCTC 185150	ZWP 200
	185		ZCTC 185185	
	16		ZCTC 24016	ZWP 150
	25		ZCTC 24025	
	35		ZCTC 24035	
	50		ZCTC 24050	
	70		ZCTC 24070	
	95		ZCTC 24095	
	120		ZCTC 240120	ZWP 200
	150		ZCTC 240150	
185	ZCTC 240185			
240	ZCTC 240240	ZWP 250		
				ZWP 150 + ZWP 150



## Cable to Cable Connection - Interlapped Cross Type

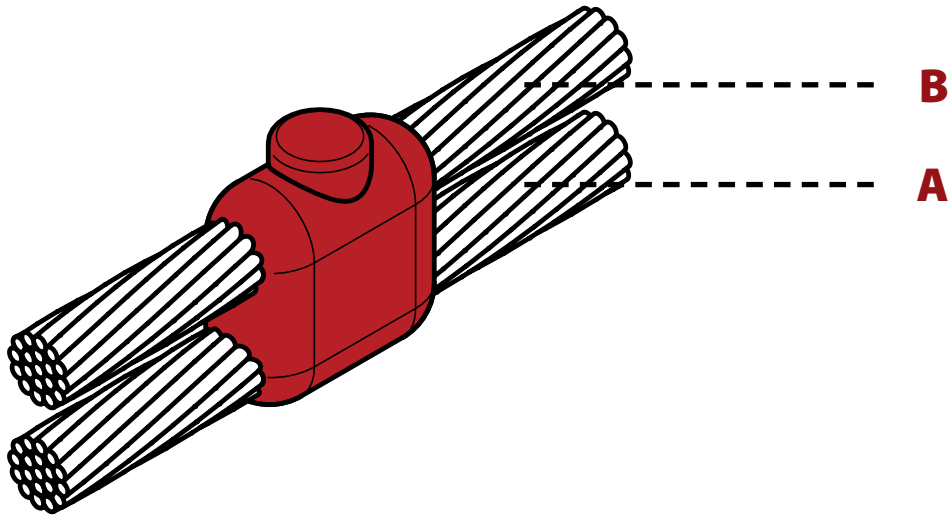


A	B	Handel Clamp	Mould Type	Powder
16	16	ZHC 60	ZCCC 1616	ZWP 045
25	16	ZHC 60	ZCCC 2516	
	25		ZCCC 2525	
35	16	ZHC 60	ZCCC 3516	ZWP 065
	25		ZCCC 35 25	
	35		ZCCC 3535	
50	16	ZHC 60	ZCCC 5016	ZWP 090
	25		ZCCC 5025	
	35		ZCCC 5035	
	50		ZCCC 5050	
70	16	ZHC 60	ZCCC 7016	ZWP 115
	25		ZCCC 7025	
	35		ZCCC 7035	
	50		ZCCC 7050	
	70		ZCCC 7070	
	95	ZHC 80	ZCCC 7095	ZWP 150
95	16	ZHC 80	ZCCC 9516	ZWP 115
	25		ZCCC 9525	
	35		ZCCC 9535	
	50		ZCCC 9550	
	70		ZCCC 9570	ZWP 150
	95		ZCCC 9595	
	120		ZCCC 95120	
120	16	ZHC 80	ZCCC 12016	ZWP 115
	25		ZCCC 12025	
	35		ZCCC 12035	
	50		ZCCC 12050	ZWP 150
	70		ZCCC 12070	
	95		ZCCC 12095	
	120		ZCCC 120120	

A	B	Handel Clamp	Mould Type	Powder
150	25	ZHC 80	ZCCC 15025	ZWP 150
	35		ZCCC 15035	
	50		ZCCC 15050	
	70		ZCCC 15070	ZWP 200
	95		ZCCC 15095	
	120		ZCCC 150120	ZWP 250
	150		ZCCC 150150	
185	ZCCC 150185			
185	25	ZHC 80	ZCCC 18525	ZWP 115
	35		ZCCC 18535	
	50		ZCCC 18550	ZWP 200
	70		ZCCC 18570	
	95		ZCCC 18595	
	120		ZCCC 185120	ZWP 250
	150		ZCCC 185150	
	185		ZCCC 185185	
240	25	ZHC 80	ZCCC 24025	ZWP 200
	35		ZCCC 24035	
	50		ZCCC 24050	ZWP 250
	70		ZCCC 24070	
	95		ZCCC 24095	
	120		ZCCC 240120	ZWP 150 + ZWP 115
	150		ZCCC 240150	
	185		ZCCC 240185	2 x ZWP 150
	240		ZCCC 240240	



## Cable to Cable Connection - Parallel Type - Vertical



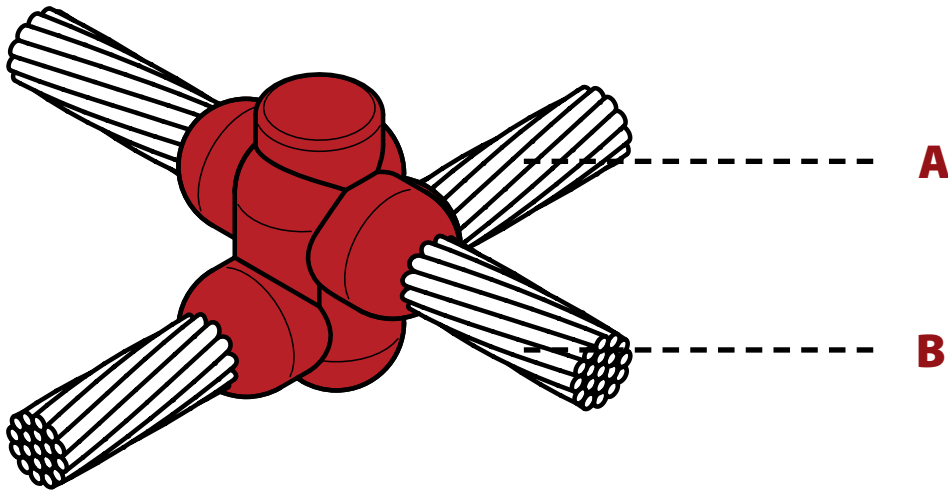
A	B	Handel Clamp	Mould Type	Powder
16	16	ZHC 60	ZCPC 1616	ZWP 065
25	16	ZHC 60	ZCPC 2516	
	25		ZCPC 2525	
35	16	ZHC 60	ZCPC 3516	ZWP 065
	25		ZCPC 3525	
	35		ZCPC 3535	
50	16	ZHC 60	ZCPC 5016	ZWP 065
	25		ZCPC 5025	
	35		ZCPC 5035	
	50	ZHC 80	ZCPC 5050	ZWP 115
70	25	ZHC 80	ZCPC 7025	ZWP 90
	35		ZCPC 7035	
	50		ZCPC 7050	ZWP 115
	70		ZCPC 7070	
95	25	ZHC 80	ZCPC 9525	ZWP 115
	35		ZCPC 9535	
	50		ZCPC 9550	
	70		ZCPC 9570	ZWP 150
	95		ZCPC 9595	
120	25	ZHC 80	ZCPC 12025	ZWP 150
	35		ZCPC 12035	
	50		ZCPC 12050	
	70		ZCPC 12070	
	95		ZCPC 12095	ZWP 200
	120		ZCPC 120120	ZWP 250

A	B	Handel Clamp	Mould Type	Powder
150	50	ZHC 80	ZCPC 15050	ZWP 150
	70		ZCPC 15070	
	95		ZCPC 15095	ZWP 200
	120		ZCPC 150120	
185	150	ZHC 80	ZCPC 150150	ZWP 250
	50		ZCPC 18550	ZWP 150
	70		ZCPC 18570	
	95		ZCPC 18595	ZWP 200
	120		ZCPC 185120	
240	150	ZHC 80	ZCPC 185150	ZWP 250
	185		ZCPC 185185	
	70		ZCPC 24070	ZWP 200
	95		ZCPC 24095	ZWP 250
120	ZCPC 240120			
150	ZCPC 240150			
240	185	ZHC 80	ZCPC 240185	2 x ZWP 150
	240		ZCPC 240240	





## Cable to Cable Connection - Pushing cross Type

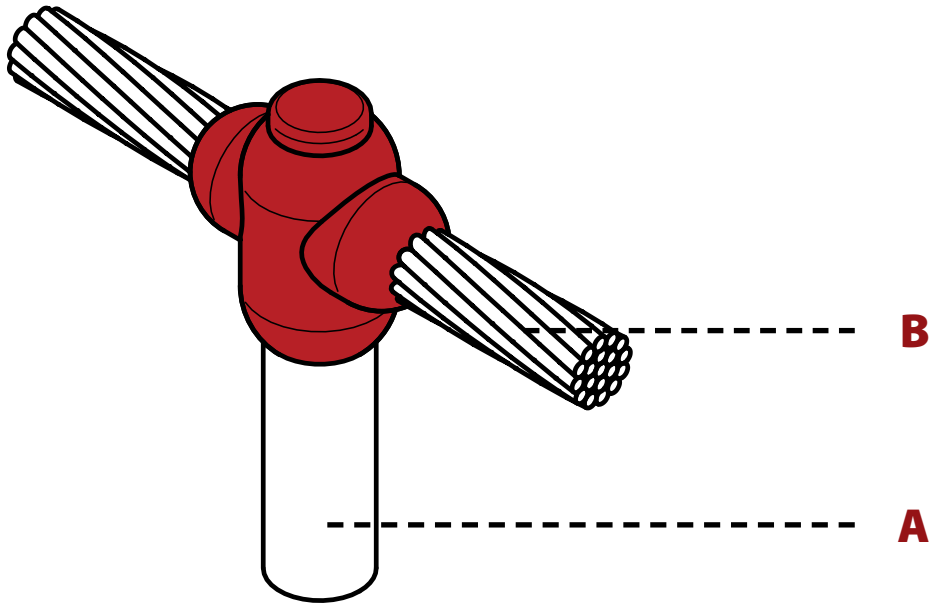


A	B	Handel Clamp	Mould Type	Powder
16	16	ZHC 80	ZCXC 1616	ZWP 115
25	16	ZHC 80	ZCXC 2516	
	25		ZCXC 2525	
35	16	ZHC 80	ZCXC 3516	ZWP 115
	25		ZCXC 3525	
	35		ZCXC 3535	
50	16	ZHC 80	ZCXC 5016	ZWP 115
	25		ZCXC 5025	
	35		ZCXC 5035	
	50		ZCXC 5050	ZWP 150
70	25	ZHC 80	ZCXC 7025	ZWP 115
	35		ZCXC 7035	ZWP 150
	50		ZCXC 7050	
	70		ZCXC 7070	
	95		ZCXC 7095	
95	25	ZHC 80	ZCXC 9525	ZWP 200
	35		ZCXC 9535	
	50		ZCXC 9550	
	70		ZCXC 9570	
	95		ZCXC 9595	
	120		ZCXC 95120	
120	25	ZHC 80	ZCXC 12025	ZWP 250
	35		ZCXC 12035	
	50		ZCXC 12050	
	70		ZCXC 12070	
	95		ZCXC 12095	
	120		ZCXC 120120	

A	B	Handel Clamp	Mould Type	Powder	
150	35	ZHC 80	ZCXC 15035	ZWP 250	
	50		ZCXC 15050		
	70		ZCXC 15070		
	95		ZCXC 15095	2 x ZWP 150	
	120		ZCXC 150120		
	150		ZCXC 150150		
185	185	ZHC 80	ZCXC 150185	ZWP 115 + ZWP 200	
	35		ZCXC 18535		ZWP 250
	50		ZCXC 18550		
	70		ZCXC 18570		2 x ZWP 150
	95		ZCXC 18595		
	120		ZCXC 185120		
	150		ZCXC 185150		
	185		ZCXC 185185		



## Cable to Rod Connection – “T” Connection

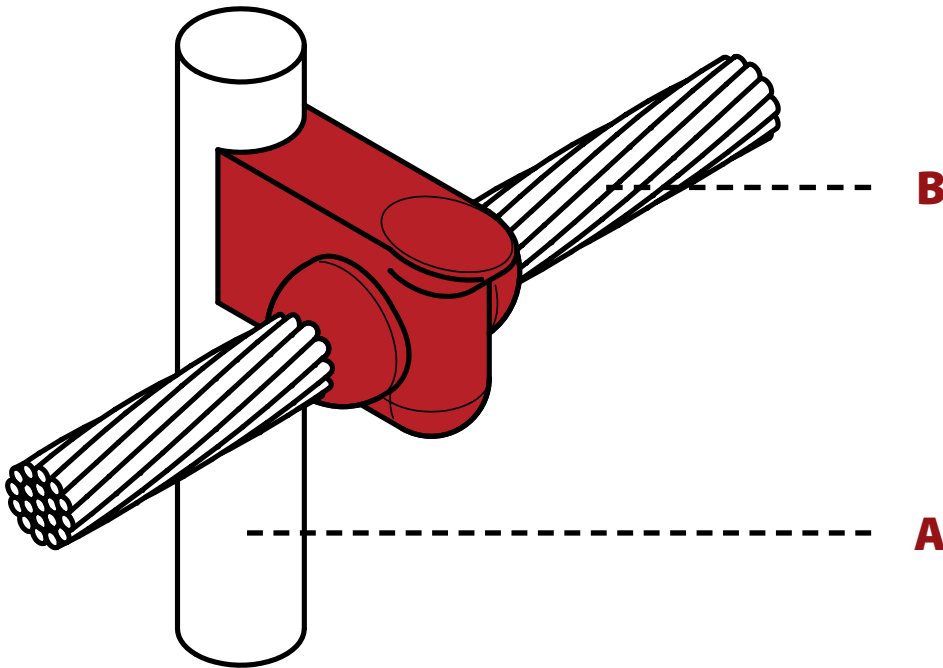


A	B	Handel Clamp	Mould Type	Powder
14.2	16	ZHC 80	ZCTR 1416	ZWP 115
	25		ZCTR 1425	
	35		ZCTR 1435	
	50		ZCTR 1450	
	70		ZCTR 1470	
	95		ZCTR 1495	ZWP 150
	120		ZCTR 14120	
	150		ZCTR 14150	
	185		ZCTR 14185	
	240		ZCTR 14240	
16	16	ZHC 80	ZCTR 1616	ZWP 115
	25		ZCTR 1625	
	35		ZCTR 1635	
	50		ZCTR 1650	
	70		ZCTR 1670	
	95		ZCTR 1695	ZWP 150
	120		ZCTR 16120	
	150		ZCTR 16150	
	185		ZCTR 16185	
	240		ZCTR 16240	

A	B	Handel Clamp	Mould Type	Powder
17.2	16	ZHC 80	ZCTR 1716	ZWP 115
	25		ZCTR 1725	
	35		ZCTR 1735	
	50		ZCTR 1750	
	70		ZCTR 1770	
	95		ZCTR 1795	ZWP 150
	120		ZCTR 17120	
	150		ZCTR 17150	
	185		ZCTR 17185	
	240		ZCTR 17240	
20	16	ZHC 80	ZCTR 2016	ZWP 115
	25		ZCTR 2025	
	35		ZCTR 2035	
	50		ZCTR 2050	
	70		ZCTR 2070	
	95		ZCTR 2095	ZWP 150
	120		ZCTR 20120	
	150		ZCTR 20150	
	185		ZCTR 20185	
	240		ZCTR 20240	



## Cable to Rod Connection - Cross Type

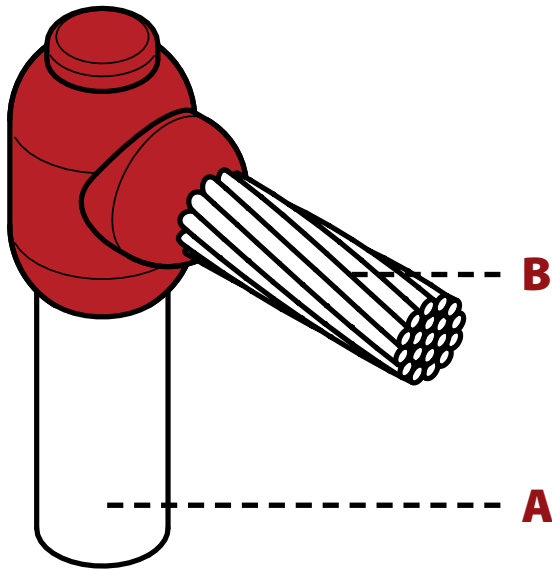


A	B	Handel Clamp	Mould Type	Powder	
14.2	16	ZHC 80	ZCSR 1416	ZWP 115	
	25		ZCSR 1425		
	35		ZCSR 1435		
	50		ZCSR 1450		
	70		ZCSR 1470		
	95		ZCSR 1490		
	120		ZCSR 14120		ZWP 150
	150		ZCSR 14150		ZWP 200
	185		ZCSR 14185		
	240		ZCSR 14240		
16	16	ZHC 80	ZCSR 1616	ZWP 115	
	25		ZCSR 1625		
	35		ZCSR 1635		
	50		ZCSR 1650		
	70		ZCSR 1670		
	95		ZCSR 1695		
	120		ZCSR 16120		ZWP 150
	150		ZCSR 16150		ZWP 200
	185		ZCSR 16185		
	240		ZCSR 16240		

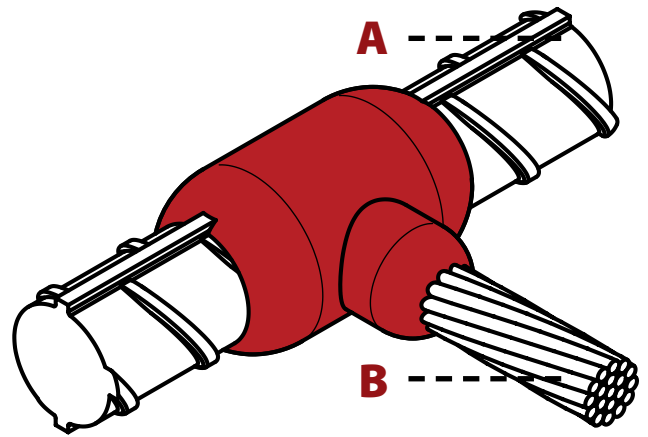
A	B	Handel Clamp	Mould Type	Powder	
17.2	16	ZHC 80	ZCSR 1716	ZWP 115	
	25		ZCSR 1725		
	35		ZCSR 1735		
	50		ZCSR 1750		
	70		ZCSR 1770		
	95		ZCSR 1795		
	120		ZCSR 17120		ZWP 150
	150		ZCSR 17150		ZWP 200
	185		ZCSR 17185		
	240		ZCSR 17240		
20	16	ZHC 80	ZCSR 2016	ZWP 115	
	25		ZCSR 2025		
	35		ZCSR 2035		
	50		ZCSR 2050		
	70		ZCSR 2070		
	95		ZCSR 2095		
	120		ZCSR 20120		ZWP 150
	150		ZCSR 20150		ZWP 200
	185		ZCSR 20185		
	240		ZCSR 20240		



## Cable to Rod Connection - "L" Type



## Cable to Reinforcing Rebar Connection - "T" Type



A	B	Handel Clamp	Mould Type	Powder	
14.2	50	ZHC 80	ZCLR 1450	ZWP 115	
	70		ZCLR 1470		
	95		ZCLR 1495		
	120		ZCLR 14120		
	150		ZCLR 14150		
	185		ZCLR 14185		ZWP 150
	240		ZCLR 14240		
16	50	ZHC 80	ZCLR 1650	ZWP 115	
	70		ZCLR 1670		
	95		ZCLR 1695		
	120		ZCLR 16120		
	150		ZCLR 16150		
	185		ZCLR 16185		ZWP 150
	240		ZCLR 16240		
	50		ZCLR 1750		
17.2	70	ZHC 80	ZCLR 1770	ZWP 150	
	95		ZCLR 1795		
	120		ZCLR 17120		
	150		ZCLR 17150		
	185		ZCLR 17185		
	240		ZCLR 17240		
	50		ZCLR 2050		
20	70	ZHC 80	ZCLR 2070	ZWP 150	
	95		ZCLR 2095		
	120		ZCLR 20120		
	150		ZCLR 20150		
	185		ZCLR 20185		
	240		ZCLR 20240		
	240		ZCLR 20240		

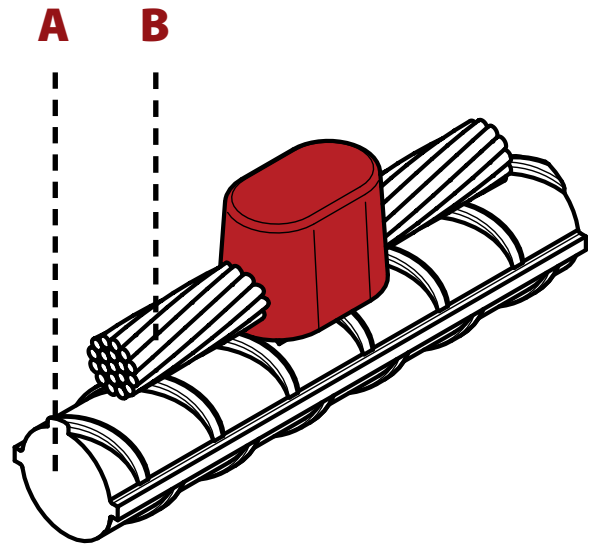
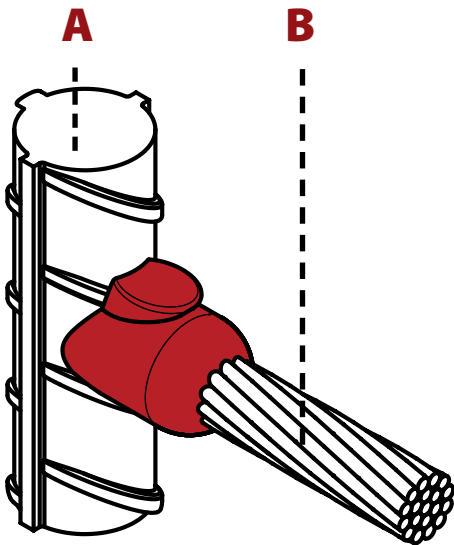
A	B	Handel Clamp	Mould Type	Powder	
10	16	ZHC 80	ZATC 1016	ZWP 090	
	25		ZATC 1025		
	35		ZATC 1035		
	50		ZATC 1050		
	70		ZATC 1070		ZWP 115
	95		ZATC 1095		
16	16	ZHC 80	ZATC 1616	ZWP 115	
	25		ZATC 1625		
	35		ZATC 1635	ZWP 150	
	50		ZATC 1650		
	70		ZATC 1670		
	95		ZATC 1695		ZWP 200
20	16	ZHC 80	ZATC 2016	ZWP 150	
	25		ZATC 2025		
	35		ZATC 2035		
	50		ZATC 2050		
	70		ZATC 2070		ZWP 200
	95		ZATC 2095		
22	120	ZHC 80	ZATC 20120	ZWP 250	
	16		ZATC 2216	ZWP 150	
	25		ZATC 2225		
	35		ZATC 2235	ZWP 200	
	50		ZATC 2250	ZWP 250	
	70		ZATC 2270	2xZWP 150	
	95		ZATC 2295	ZWP 150 + ZWP 200	
	120		ZATC 22120		





## Cable to Reinforcing Rebar Connection – "L" Type

## Cable to Reinforcing Rebar Connection – Parallel Type



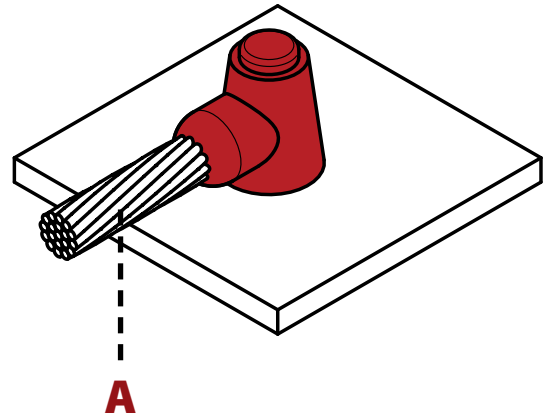
A	B	Handel Clamp	Mould Type	Powder
10	16	ZHC 80	ZALC 1016	ZWP 090
	25		ZALC 1025	
	35		ZALC 1035	
	50		ZALC 1050	ZWP 115
	70		ZALC 1070	
	95		ZALC 1095	
16	16	ZHC 80	ZALC 1616	ZWP 90
	25		ZALC 1625	
	35		ZALC 1635	ZWP 150
	50		ZALC 1650	
	70		ZALC 1670	
	95		ZALC 1695	
20	16	ZHC 80	ZALC 2016	ZWP 115
	25		ZALC 2025	
	35		ZALC 2035	
	50		ZALC 2050	ZWP 150
	70		ZALC 2070	
	95		ZALC 2095	
	120		ZALC 20120	
22	16	ZHC 80	ZALC 2216	ZWP 150
	25		ZALC 2225	
	35		ZALC 2235	ZWP 200
	50		ZALC 2250	
	70		ZALC 2270	ZWP 2x150
	95		ZALC 2295	ZWP 200 + ZWP 150
	120		ZALC 22120	

A	B	Handel Clamp	Mould Type	Powder	
10	16	ZHC 60	ZAPC 1016	ZWP 065	
	25		ZAPC 1025		
	35		ZAPC 1035		
	16	50	ZHC 80	ZAPC 1050	ZWP 115
		70		ZAPC 1070	ZWP 150
		95		ZAPC 1095	
16		ZHC 60		ZAPC 1616	
25				ZAPC 1625	
35				ZAPC 1635	ZWP 115
20	50	ZHC 80	ZAPC 1650	ZWP 150	
	70		ZAPC 1670		
	95		ZAPC 1695	ZWP 200	
	120		ZAPC 16120		
	150		ZAPC 16150		
	20		25	ZHC 60	ZAPC 2025
35		ZAPC 2035			
50		ZHC 80	ZAPC 2050	ZWP 150	
70			ZAPC 2070		
95			ZAPC 2095	ZWP 200	
120			ZAPC 20120		
150			ZAPC 20150		
185			ZAPC 20185	ZWP 250	
240			ZAPC 20240		
300			ZAPC 20300	2 x ZWP 150	

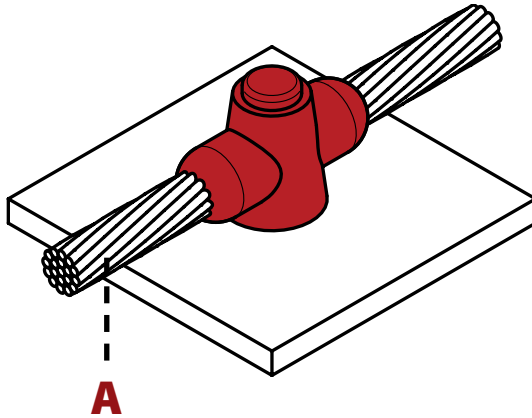


## Cable to Steel Surface Connection

A	Handel Clamp	Mould Type	Powder
25	ZHC 60	ZCES 25	ZWP 65
35		ZCES 35	
50	ZHC 80	ZCES 50	ZWP 090
70		ZCES 70	
95		ZCES 95	
120		ZCES 120	ZWP 115
150		ZCES 150	ZWP 150
185		ZCES 185	ZWP 200
240		ZCES 240	ZWP 250



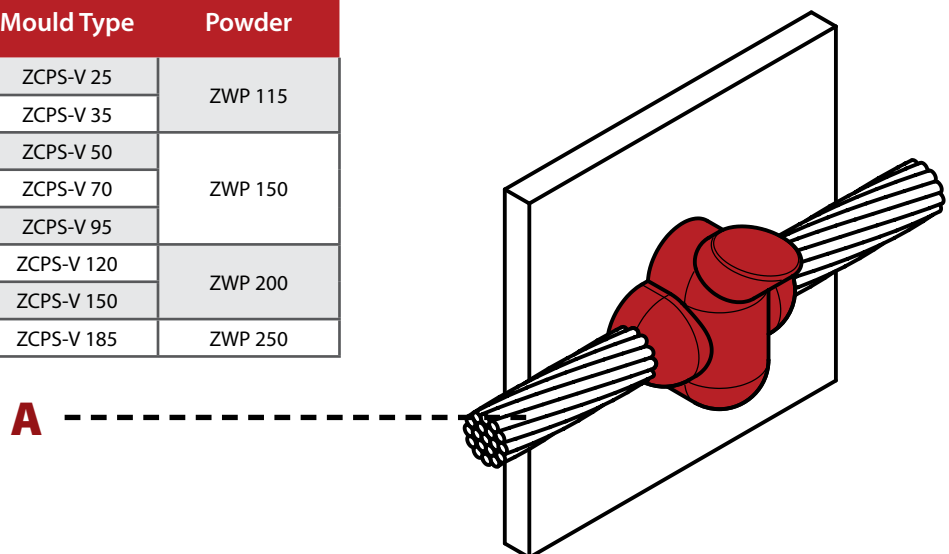
## Cable to Steel Surface Horizontal Connection - Run Type



A	Handel Clamp	Mould Type	Powder
25	ZHC 60	ZCPS-H 25	ZWP 115
35		ZCPS-H 35	
50	ZHC 80	ZCPS-H 50	ZWP 150
70		ZCPS-H 70	
95		ZCPS-H 95	
120		ZCPS-H 120	ZWP 200
150		ZCPS-H 150	
185		ZCPS-H 185	ZWP 250

## Cable to Steel Surface Vertical Connection - Run Type

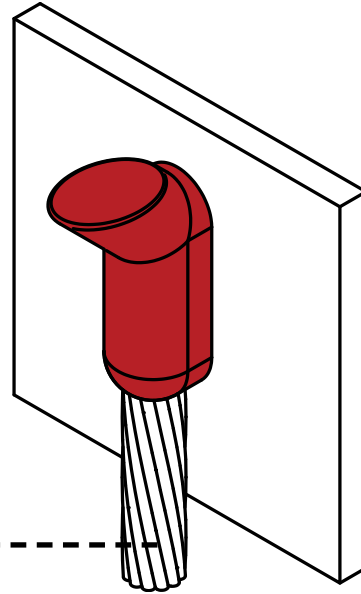
A	Handel Clamp	Mould Type	Powder
25	ZHC 60	ZCPS-V 25	ZWP 115
35		ZCPS-V 35	
50	ZHC 80	ZCPS-V 50	ZWP 150
70		ZCPS-V 70	
95		ZCPS-V 95	ZWP 200
120		ZCPS-V 120	
150	ZCPS-V 150		
185		ZCPS-V 185	ZWP 250





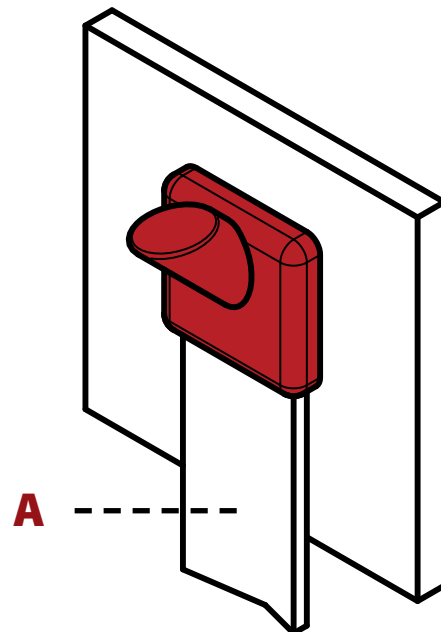
## Cable to Steel Surface Vertical Connection - Upwards Type

A	Handel Clamp	Mould Type	Powder
25	ZHC 60	ZCUS 25	ZWP 65
35		ZCUS 35	
50	ZHC 80	ZCUS 50	ZWP 090
70		ZCUS 70	
95		ZCUS 95	
120		ZCUS 120	ZWP 115
150		ZCUS 150	ZWP 150
185		ZCUS 185	ZWP 200
240		ZCUS 240	ZWP 250



## Tape to Steel Surface Connection - Upwards Tape

A	Handel Clamp	Mould Type	Powder
20x3	ZHC 60	ZTUS 203	ZWP 090
25x3		ZTUS 253	ZWP 090
25x5	ZHC 80	ZTUS 255	ZWP 115
30x3		ZTUS 303	
30x5		ZTUS 305	
40x3		ZTUS 403	ZWP 150
40x5		ZTUS 403	ZWP 200





## Inspection of ZINOWELD Connections Visual Inspection

### Photographic Guides

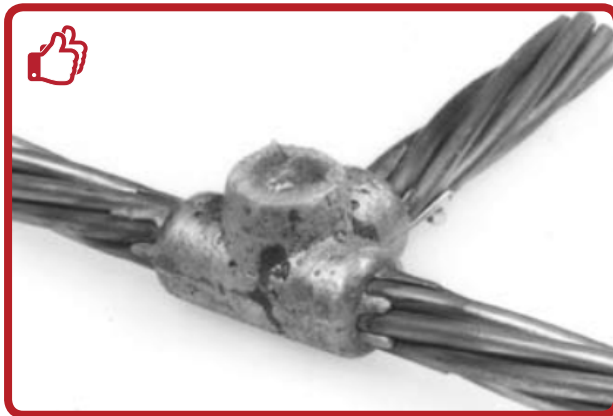
Like all electrical connections, a visual inspection is no guarantee of performance. Crimped or bolted connections cannot be inspected visually, but ZINOWELD connections can be visually inspected and provide an indication of the quality of the weld. Visual inspection is recommended as a practical minimum.

Use the photographs on the following pages as a guide to visual inspection. ZINOWELD connections are normally rated as good, acceptable or reject.

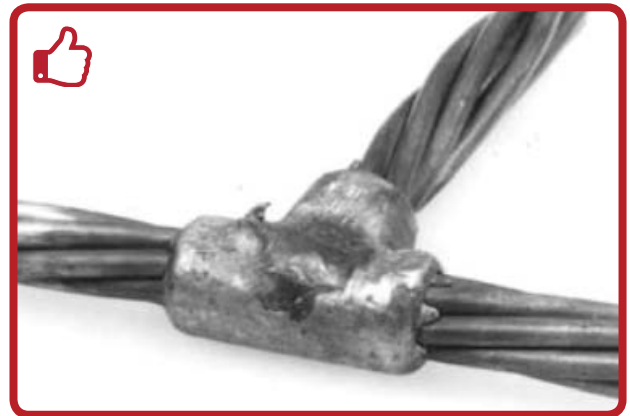
A good connection is a normal weld with only minor surface imperfections.

An acceptable connection is a less than normal weld, but a good performing weld. Imperfections indicate that 1) a new mold is required, 2) a change in procedure is necessary, or 3) the proper mold conductor and/or welding material should be used.

A reject connection shows inadequate fill or an extra high riser due to 1) use of incorrect procedure, 2) use of incorrect equipment and/or equipment worn beyond its useful life, or 3) use of incorrect material.



A solid weld with only minor surface imperfections.



Fill is lower than normal, but still sufficient.



A worn or incorrect mold was used, allowing leakage around conductor. The fill in this connection is sufficient to allow it as acceptable. Attention to mold is required prior to making next connection.



The presence of water/moisture in conductor strands or mold indicates that one or both were not properly dried. Although the riser is porous, the weld is solid. The degree of porosity is not sufficient to reject this connection.





Extreme amounts of slag on surface are caused by welding material leaking past disk or complete lack of disk. Inspect the condition of mold disk seat and check disk positioning prior to making the next connection.



Excessive water in cable strands and/or mold. Cable and mold must be dried by heating.



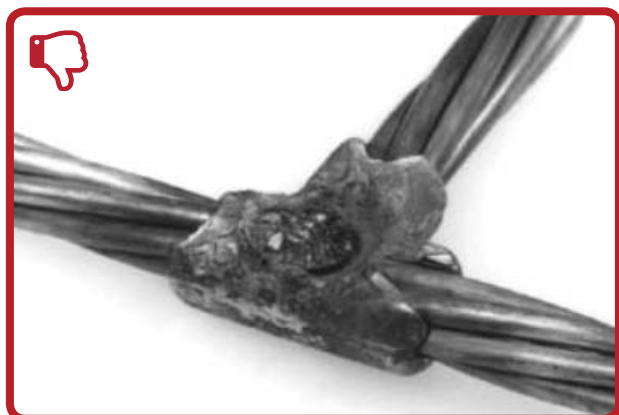
Light carbon traces on cable and connection are evidence of oil on cable strands. Oily cables must be cleaned with safety solvent.



Heavy carbon coating on cable and connection is evidence of large amounts of oil or grease on cable. Cable must be cleaned with safety solvent.



Fill too low. Weld cavity was not filled over cable strands. "Fins" indicate that the mold was not closed tightly due to incorrect mold, incorrectly adjusted handle clamp, or presence of foreign material in mold parting line. Before making the next connection, check the mold for each of the above.



Fill too low. Weld cavity was not filled over cable strands. Absence of leakage indicates that welding material size was incorrect (too small) or thru conductor moved.







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