

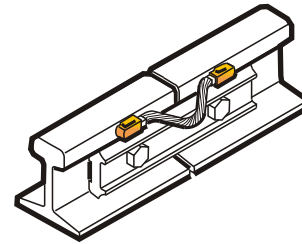


# Aluminothermic Welding **CABLE to RAIL**



# CONNECTIONS

## CRA - CRR

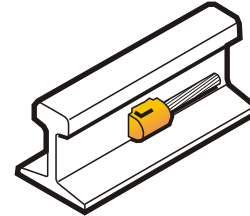


WELDING OF RAIL HEAD BONDS

	mm <sup>2</sup>	MOULD	CARTRIDGE	CLAMP	SLEEVE	DIE
WITH SLEEVE	35	CRA-CRR 35/S	C- 45	TRA-D	S- 35	H- 35
	50	CRA-CRR 50/S	C- 45	TRA-D	S- 50	H- 50
	70	CRA-CRR 70/S	C- 65	TRA-D	S- 70	H- 70
	95	CRA-CRR 95/S	C- 90	TRA-D	S- 95	H- 95
	120	CRA-CRR 120/S	C- 115	TRA-D	S- 120	H- 120
	150	CRA-CRR 150/S	C- 150	TRA-D	S- 150	H- 150
WITHOUT SLEEVE	35	CRA-CRR 35	C- 45	TRA-D		
	50	CRA-CRR 50	C- 45	TRA-D		
	70	CRA-CRR 70	C- 65	TRA-D		
	95	CRA-CRR 95	C- 90	TRA-D		
	120	CRA-CRR 120	C- 115	TRA-D		
	150	CRA-CRR 150	C- 150	TRA-D		

Add to the mould reference: **(D)** For Right hand mould. **(L)** For Left hand mould. Right hand supplied if not specified

## CRA - TA



WELDING OF TAP CABLE TO RAIL WEB

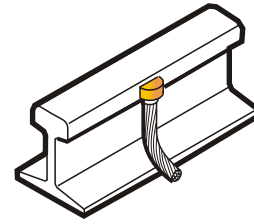
	mm <sup>2</sup>	MOULD	CARTRIDGE	CLAMP	SLEEVE	DIE
WITH SLEEVE	35	CRA-TA 35/S	C- 45	TRA-A	S- 35	H- 35
	50	CRA-TA 50/S	C- 65	TRA-A	S- 50	H- 50
	70	CRA-TA 70/S	C- 90	TRA-A	S- 70	H- 70
	95	CRA-TA 95/S	C- 90	TRA-A	S- 95	H- 95
	120	CRA-TA 120/S	C- 115	TRA-A	S- 120	H- 120
	150	CRA-TA 150/S	C- 150	TRA-A	S- 150	H- 150
WITHOUT SLEEVE	35	CRA-TA 35	C- 45	TRA-A		
	50	CRA-TA 50	C- 65	TRA-A		
	70	CRA-TA 70	C- 90	TRA-A		
	95	CRA-TA 95	C- 90	TRA-A		
	120	CRA-TA 120	C- 115	TRA-A		
	150	CRA-TA 150	C- 150	TRA-A		

Add to the mould reference: **(D)** For Right hand mould. **(L)** For Left hand mould. Right hand supplied if not specified

**IT IS NECESSARY TO KNOW THE RAIL PROFILE TO ADAPT THE MOULD TO THE RAIL CONTOUR**

# CONNECTIONS

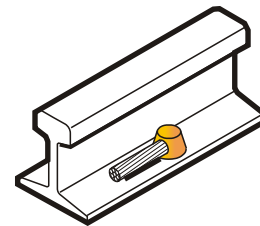
## CRA - TC



WELDING OF TAP CABLE TO RAIL HEAD

	mm <sup>2</sup>	MOULD	CARTRIDGE	CLAMP	SLEEVE	DIE
WITH SLEEVE	35	CRA-TC 35/S	C- 45	TRA-C	S- 35	H- 35
	50	CRA-TC 50/S	C- 65	TRA-C	S- 50	H- 50
	70	CRA-TC 70/S	C- 65	TRA-C	S- 70	H- 70
	95	CRA-TC 95/S	C- 90	TRA-C	S- 95	H- 95
	120	CRA-TC 120/S	C- 115	TRA-C	S- 120	H- 120
	150	CRA-TC 150/S	C- 115	TRA-C	S- 150	H- 150
WITHOUT SLEEVE	35	CRA-TC 35	C- 45	TRA-C		
	50	CRA-TC 50	C- 65	TRA-C		
	70	CRA-TC 70	C- 65	TRA-C		
	95	CRA-TC 95	C- 90	TRA-C		
	120	CRA-TC 120	C- 115	TRA-C		
	150	CRA-TC 150	C- 115	TRA-C		

## CRA - TP



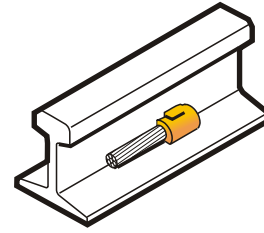
WELDING OF TAP CABLE TO RAIL FOOT

	mm <sup>2</sup>	MOULD	CARTRIDGE	CLAMP	SLEEVE	DIE
WITH SLEEVE	35	CRA-TP 35/S	C- 45	TRA-P50	S- 35	H- 35
	50	CRA-TP 50/S	C- 65	TRA-P50	S- 50	H- 50
	70	CRA-TP 70/S	C- 65	TRA-P50	S- 70	H- 70
	95	CRA-TP 95/S	C- 90	TRA-P50	S- 95	H- 95
	120	CRA-TP 120/S	C- 115	TRA-P50	S- 120	H- 120
	150	CRA-TP 150/S	C- 115	TRA-P50	S- 150	H- 150
WITHOUT SLEEVE	35	CRA-TP 35	C- 45	TRA-P50		
	50	CRA-TP 50	C- 65	TRA-P50		
	70	CRA-TP 70	C- 65	TRA-P50		
	95	CRA-TP 95	C- 90	TRA-P50		
	120	CRA-TP 120	C- 115	TRA-P50		
	150	CRA-TP 150	C- 115	TRA-P50		

IT IS NECESSARY TO KNOW THE RAIL PROFILE TO ADAPT THE MOULD TO THE RAIL CONTOUR

# CONNECTIONS

## CRA - TH

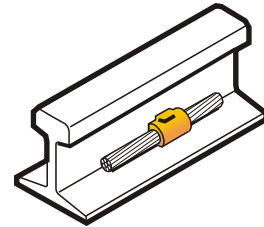


WELDING OF TAP CABLE TO RAIL WEB-FOOT FILLET

	mm <sup>2</sup>	MOULD	CARTRIDGE	CLAMP	SLEEVE	DIE
WITHOUT SLEEVE	35	CRA-TH 35	C- 65	TSC-80		
	50	CRA-TH 50	C- 65	TSC-80		
	70	CRA-TH 70	C- 90	TSC-80		
	95	CRA-TH 95	C- 115	TSC-80		
	120	CRA-TH 120	C- 150	TSC-80		
	150	CRA-TH 150	C- 150	TSC-80		

Add to the mould reference: **(D)** For Right hand mould. **(L)** For Left hand mould. Right hand supplied if not specified

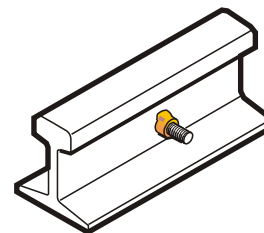
## CRA - PH



WELDING OF THROUGH CABLE TO RAIL WEB-FOOT FILLET

	mm <sup>2</sup>	MOULD	CARTRIDGE	CLAMP	SLEEVE	DIE
WITHOUT SLEEVE	35	CRA-PH 35	C- 90	TSC-80		
	50	CRA-PH 50	C- 90	TSC-80		
	70	CRA-PH 70	C- 115	TSC-80		
	95	CRA-PH 95	C- 150	TSC-80		
	120	CRA-PH 120	C- 200	TSC-80		
	150	CRA-PH 150	C- 200	TSC-80		

## BRA - V

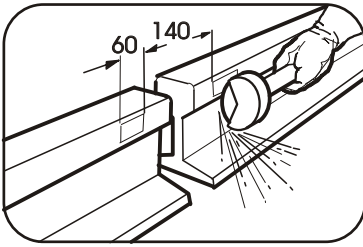


WELDING OF THREADED STUDS TO RAIL WEB

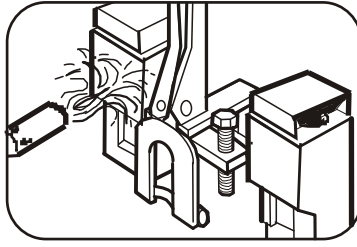
	STUD SIZE	MOULD	CARTRIDGE	CLAMP		
	M 10	BRA-V-M10	C- 65	TSC-80		
	M 12	BRA-V-M12	C- 90	TSC-80		
	M 16	BRA-V-M16	C- 115	TSC-80		

IT IS NECESSARY TO KNOW THE RAIL PROFILE TO ADAPT THE MOULD TO THE RAIL CONTOUR

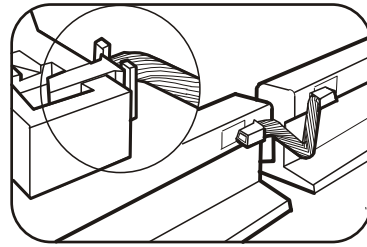
# KLK-SOLDAL Welding Procedure



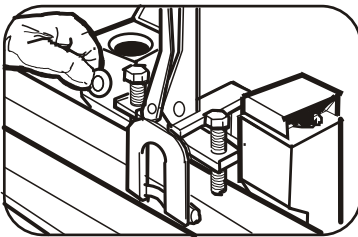
Remove with a smoother vestiges of grease.  
Grind with grinding tool the sites on the rail head where de bond will be brazed on a length of 60 mm each with a distance between them as appropriate  
After grinding the sites, go over lightly with a Cardcloth brush



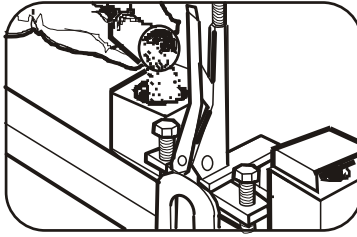
Assemble the Moulds and the Handleclamp by fitting the notch, which is at the base of the moulds, over the bars inside the moulds support frame. Tighten the screws that hold the moulds in position.  
Before starting the first weld, preheat the moulds with a blowlamp during 3 minutes. This is very important because moisture in moulds will cause porous welds.



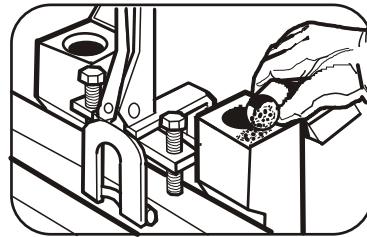
Before mounting the bond its sleeves must be cleaned using the Cardcloth brush.  
Place each bond end in the mould's welding cavity, being careful that the bevelled end faces upwards.  
Once the handleclamp - moulds - bond assembly has been mounted on the railhead, pull on with gentleness the bond to bring the collars into position behind the bond fixing plates.



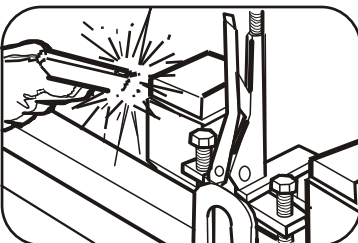
Place the handleclamp - moulds - bond assembly on the railhead. Adjust the height with the 2 bolts so that the base of the moulds is 1 or 2 mm above the fishplate. Adjust the pressure of the clamp's grip by means of the adjusting screw at the tip of the clamp's handle.  
The rail must be protected against possible molten metal losses by means of a fireproof covering (fiber glass cloth, sheet-metal or mastic).



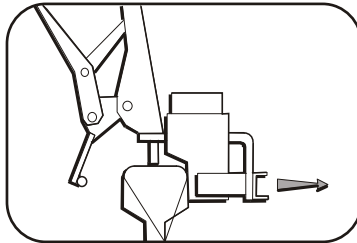
Place the metal disc, conical side to the bottom, on tap hole of each crucible.  
Open the coloured tap of one Cartridge and pour into the crucible the aluminothermic powder.  
Repeat for the other mould.



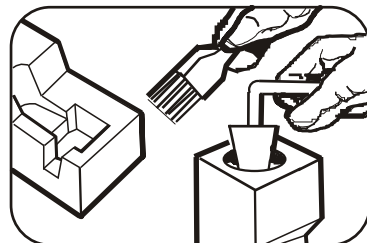
Open the black tap and spread all the starting powder over the welding powder and on the top edge of the mould, under open cover, for easy ignition.  
Repeat for the other mould.



Close the moulds' covers and ignite the starting powder with the Flint igniter, in both moulds.



Wait for a few until the metal has solidified and unlock the vice-grip clamp.  
Pull the moulds assembly out horizontally. Not attempt to lever off the clamp as this will damage moulds.



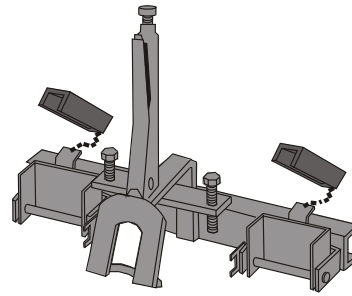
Remove slag in the crucibles and tap-hole with the Scraper.  
Remove dust and oxides debris in the mould by using a Paintbrush.  
If the moulds are still warm, you can start again the welding operations without preheating them.

# RAIL HANDLE CLAMPS

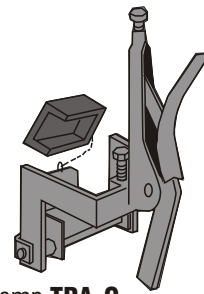
Rail handle clamps are designed to hold the mould against the rail.

The clamp mould's fixing mechanism allows an easy mould's exchange and is also adjustable for adaptation to the rail contour.

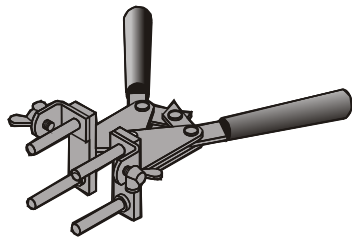
To prevent molten metal leaks it is advised to fit a copper sleeve formed half round at the cable end using the copper sleeves and hammer dies stated in the selections charts, otherwise sealing paste is required to seal the gap between the cable and the rail surface.



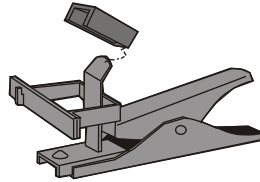
Handle clamp **TRA-D**  
Handle clamp **TRA / V-16**



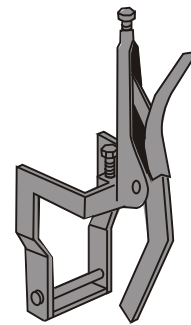
Handle clamp **TRA-C**  
Handle clamp **TRA / V-17**



Handle clamp **TSC-80**

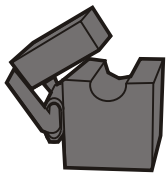


Handle clamp **TRA-P**



Handle clamp **TRA-A**

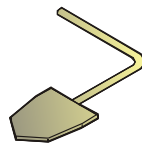
## Accessories



Hammerdie **H-35**  
Hammerdie **H-50**  
Hammerdie **H-70**  
Hammerdie **H-95**  
Hammerdie **H-120**  
Hammerdie **H-150**



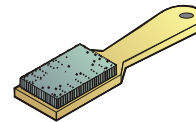
Sleeve **S-35**  
Sleeve **S-50**  
Sleeve **S-70**  
Sleeve **S-95**  
Sleeve **S-120**  
Sleeve **S-150**



Mould scraper **R-45**  
(For C-45 and C-65)  
Mould scraper **R-90**  
(For C-90 and C-115)  
Mould scraper **R-150**  
(For C-150 and C-250)



Flint Igniter



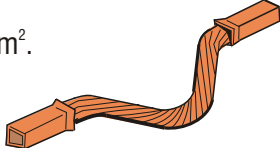
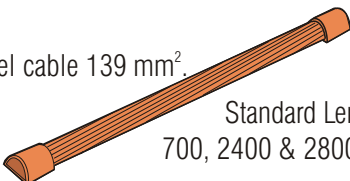
Cardclothbrush

## Standard CABLE/RAIL connections

Each Railways Administration has its own standard connections to the rail for different purposes: traction return current or signal connections.

The aluminothermic welding method is the most suitable one for making these connections.

The Spanish Railways (RENFE) has standardized according to its Technical Specification No. E.T. 03.364.005.3, the following cable to rail connections:

<p><b>V-16</b> Copper cable 50 mm<sup>2</sup>. Length: 225 mm.</p> 	<p><b>V-17</b> Copper-Steel cable 139 mm<sup>2</sup>. Standard Lengths: 700, 2400 &amp; 2800 mm.</p> 
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Materials and equipment required for welding the above prefabricated bonds:

BOND	MOULD REF.	CARTRIDGE	CLAMP
<b>V-16</b>	<b>CRA-CRR V-16</b>	<b>C-45 R</b>	<b>TRA/V-16</b>
<b>V-17</b>	<b>CRA-TC V-17</b>	<b>C-90 R</b>	<b>TRA/V-17</b>



**Electro Materiales, s.a.**

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