

# TIS working group Digital Automatic Coupler (DAC)

## Requirements for the electrical contacts in the coupling

<b>Version</b>	<b>Author</b>	<b>Changes</b>	<b>Date</b>
1.0	RH/KR	Creation	07.02.2020
1.1	RH/KR	Review DB Systemtechnik, Insultation resistance added	17.02.2020
1.2.3	RH/KR/FE	Coupler cable specification added	09.03.2020

# 1 Electrical contacts in the coupling

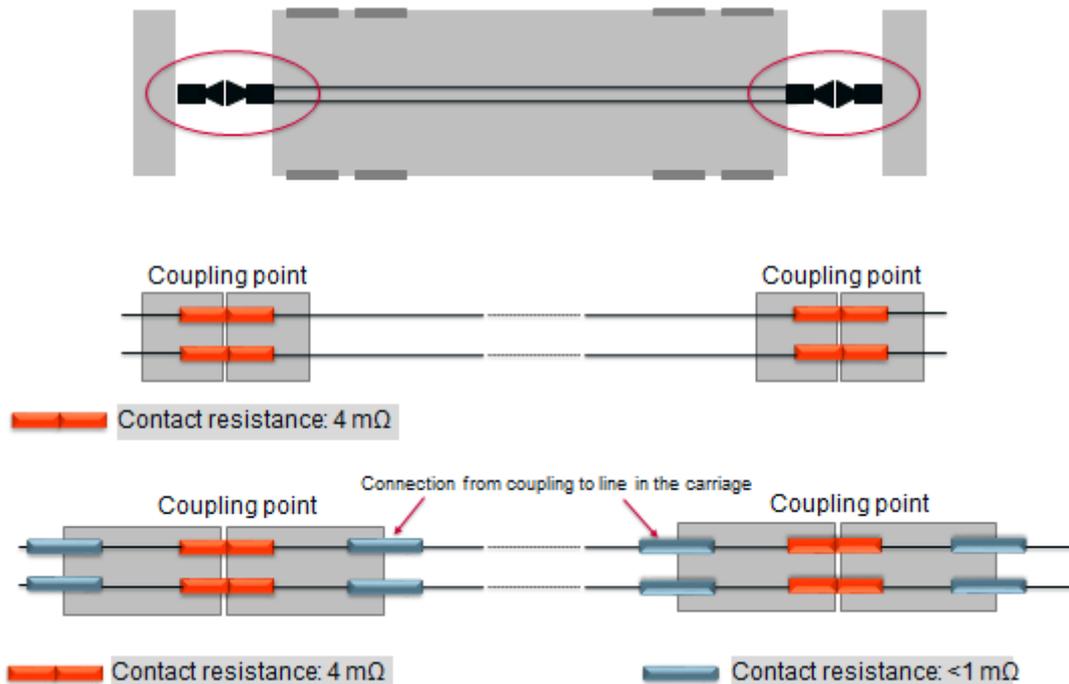
The contacts required in the coupling are listed in Table 1. Eight independent electrical connections must be ensured. The designations of the signals are only provisional and are intended for understanding purposes.

**Table 1: Electrical contacts in the coupling**

Description	Nominal voltage	Nominal current	Designation	Cable cross-section
Energy transmission	110 Vdc	25 A (35 A)	+	16 mm <sup>2</sup> (optional 22-25 mm <sup>2</sup> )
Energy transmission	110 Vdc	25 A (35 A)	-	16 mm <sup>2</sup> (optional 22-25 mm <sup>2</sup> )
Data transmission	<24 V	<1 A	Data1	0,75 mm <sup>2</sup>
Data transmission	<24 V	<1 A	Data1b	0,75 mm <sup>2</sup>
Data transmission	<24 V	<1 A	Data2	0,75 mm <sup>2</sup>
Data transmission	<24 V	<1 A	Data2b	0,75 mm <sup>2</sup>
EP-Brake	110 V	5 A	EP+	4 mm <sup>2</sup>
EP-Brake	110 V	5 A	EP-	4 mm <sup>2</sup>

## 1.1 Contact resistance for energy transmission and EP-Brake

The total resistance for the energy transmission and EP-Brake in the coupling must be **less than 5 mΩ** (7 mΩ including reserve over lifetime). This includes the transition from the line of one wagon through the coupling and into the line of the following wagon. Figure 1 is intended to explain the contact resistance.



**Figure 1: Contact resistance in the coupling**

## 1.2 Contact resistance for data transmission and EP-Brake

The total resistance in the coupling must be **less than 25 mΩ** for the data transmission.

## 1.3 Insulation resistance

The insulation resistance between the electrical power contacts (110 V) and ground shall be at least **800 MΩ**. This requirement holds for all electrical power contacts of one electric coupler connected to each other.

This requirement is necessary to guarantee that in all train configurations of up to 60 wagons the combined insulation resistance is above 1 MΩ which is required in EN 50343 for equipment with operating voltages of up to 300 V.

The dielectric withstand test is to be conducted with **1500 V** according to EN 50155 (for operating voltages of 72 V to 125 V DC).

## 2 Coupler to wagon conjunction

The connection between the coupler and the wagon should be standardized. This section defines the cable types which should be applied to the coupler for the wagon connection.

### 2.1 Cable types

**Table 2: Single cables for coupler to wagon conjunction**

Description	Cable cross-section	Type	Wave impedance
Energy transmission	2x 16 mm <sup>2</sup>	-	
EP brake	2x 4 mm <sup>2</sup>	-	
Data transmission 1	2x 0,5 mm <sup>2</sup> - 0,75 mm <sup>2</sup>	STP	120 Ω
Data transmission 2	2x 0,5 mm <sup>2</sup> - 0,75 mm <sup>2</sup>	STP	120 Ω
Antenna cable	-	RG58, RG213	50 Ω

The cables shown in Table 2 should be combined in a single cable or flexible pipe. If redundant contacts exist (e.g. for reasons of contact pattern symmetry), the connection between these contacts and the corresponding wire shall be made in the coupler. The single cable or flexible pipe must be equipped with a fitting to connect to the junction box, where a bore hole of 40 mm diameter is provided (without thread). The fitting must comply with IP65 or better.

The length of the cables (including pipe) should protrude **200 cm** above the mechanical coupling connection to the wagon. It shall be possible to shorten the cables (and pipe) according to the mounting conditions at each specific wagon while maintaining the IP protection class and without the need for special tooling.

The supplier shall provide appropriate fixtures for the cable (including pipe) from the electric coupler to the junction box, considering the movements of the coupler during operation.