1. Purpose of the Standard

This standard defines uniform interfaces according to the PluX standard for safe and fast installation or replacement of electronic assemblies (decoders or others) in vehicles using 12-, 16- or 22-pin connectors depending on the range of functions.

Notes: Interfaces according to this standard sheet essentially correspond to those according to

- NMRA RP-9.1.1 Edition of July 2012 without PluX8 and supplemented by PluX12.
- RailCommunity standard RCN-122 (www.railcommunity.org) also details this family of connectors.

2. Interface Description

This interface can be used in vehicles with DC motors and / or function decoders.

2.1 Mechanical Properties

The interface on the system board is composed of 12, 16 or 22 sockets in 2 rows parallel with a pitch of 1.27 mm.
The number of pins of the male, decoder connectors is matched against the system board. If the number of pins is less than the number of sockets on the socket, not all possible locomotive functions will be available. In the event that there are more pins than sockets on the female plug (as long as there is sufficient space and the holes allow it) it will not be possible to use all decoder functions.
The electrical devices (decoders) have pin-interfaces on their bottom side (see fig. 1).

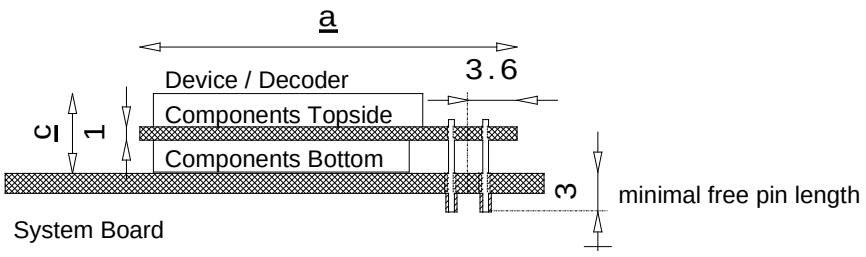

Fig. 1: Arrangement of the decoder on the system board, dimensions according to table 2

Pin and socket headers are arranged in two rows of 6, 8 or 11 contacts and preferably soldered directly into the circuit boards. The center of the pin header is 3.6 mm from the edge of the decoder board.
Pins and sockets correspond to the usual dimensions of this connector type. The pins have either a square profile with 0.40 mm edge length or a round profile with a diameter of 0.43 mm, a gold-plated surface and a contact load capacity of max. 1 A.
Correct orientation of the decoder with the vehicle circuit board respective is achieved by omitting Pin 11 on the decoder and blocking the associated socket. See also figure 2.
Compliance with the free pin length is important for the reliable function of the plug connection below the underside of the module, with a minimum length of 3 mm and the socket length of at least 2 mm.

Vehicles with a factory-installed interface must be clearly marked on the packaging with the Identification letters PluX12, PluX16, PluX16-S or PluX22.

2.2 Electrical Properties

Manufacturers must specify the maximum output current capability of the decoder.
If the vehicle lighting is integrated to the socket, it must be switched by F0f (front lighting) and F0r (rear lighting).
If additional functions (inputs / outputs A - C) are available, they will be fitted with solder contacts on the system board.
If for reasons of space the modules are connected by strips of flat wires, the colours of these wires are not imposed. They are only used for single connections.

2.3 Contact assignment of the interface for the use of decoders

The contact assignment of the interfaces in the PluX version is defined in Table 1. Plux12 is no longer recommended for new developments.

Table 1: Pin assignment, Wire color and Description of the function

PluX12 Pin	PluX16 Pin	PluX22 Pin	Name	Wire Color	Description
		1	GPIO / C		General purpose input / output
		2	AUX3		Output 3
	3	3	GPIO / B		Train bus clock[1)]
	4	4	GPIO / A		Train bus data[1)]
	5	5	GND		Decoder minus, tap behind rectifier
	6	6	V+ Cap.	blue	Decoder plus, tap after rectifier, Connection of buffer capacitor
7	7	7	F0f	white	Light during forward direction of travel
8	8	8	Motor +	orange	Motor connection plus[2)]
9	9	9	V+	blue	Decoder plus, tap behind rectifier
10	10	10	Motor -	gray	Motor connection minus[2)]
11	11	11	Index		Not used, Decoder orientation
12	12	12	Power pick-up right	red	Power pick-up on the right in the forward direction of travel
13	13	13	F0r	yellow	Light during backwards direction of travel
14	14	14	Power pick-up left	black	Power pickup on the left in the forward direction of travel
15	15	15	LS / A		Loudspeaker connection A
16	16	16	AUX1	green	output 1, tail lights during forward direction of travel
17	17	17	LS / B		Loudspeaker connection B
18	18	18	AUX2	purple	Output 2, tail lights during backwards direction of travel
		19	AUX4		Output 4
		20	AUX5		Output 5
		21	AUX6		Output 6
		22	AUX7		Output 7

[1)] The processor pins of the train bus are direct with a series impedance of max. 470 Ω.
[2)] The specified polarity refers to the motor connections for direction of travel 1 (forward) as per NEM 631.

3. Dimensions of the space for electronic assemblies

With the exception of the PluX12, the electronic assemblies are arranged symmetrically to the interfaces. With PluX12, the assembly is off-center by 1.27 mm (1 pin grid) from 7/8. This also applies to the vehicle installation space.

Table 2: Decoder Dimensions

	PluX12	PluX16	PluX16-S (Sound)	PluX22
Length a	20.0	20.0	28.0	35.0
Width b	11.0	11.0	16.0	16.0
Hight c	4.2	4.2	6.0	6.0

Note: The installation space for the decoder in the vehicle must be sized in such a way that it is compatible with the maximum dimensions according to table 2 without constraint. Installation and removal must not require special tools.

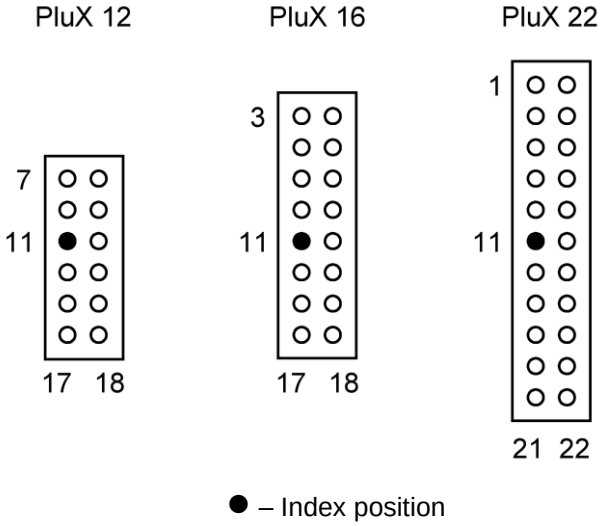

Fig. 2: Assignment of the connector variants of the PluX version and identification of the Indexing with relation to the socket strips.

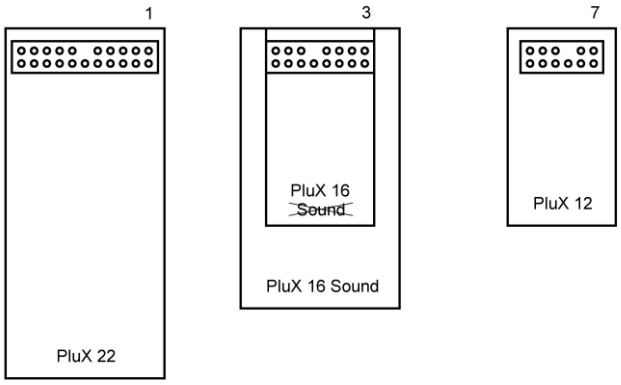

Fig. 3: Size comparison of the areas reserved for the electronic assemblies depending on the PluX variants. (schematics, about 1:1), View of the top of the decoder

4. Operation without a decoder

When operating without a decoder, a blanking plug shall be used which must connect socket 12 with socket 8 (right rail pickup to Motor +) and socket 14 with socket 10 (left rail pickup to Motor -).

If there is vehicle lighting, bridge connections should be provided to operate the lights appropriately.