

SAE J-3105 Heavy-Duty Conductive Automatic Charging Recommended Practice

**Presenter: Mark Kosowski,
EPRI**

**SAE J-3105 Committee
Chairperson**

June 12, 2018



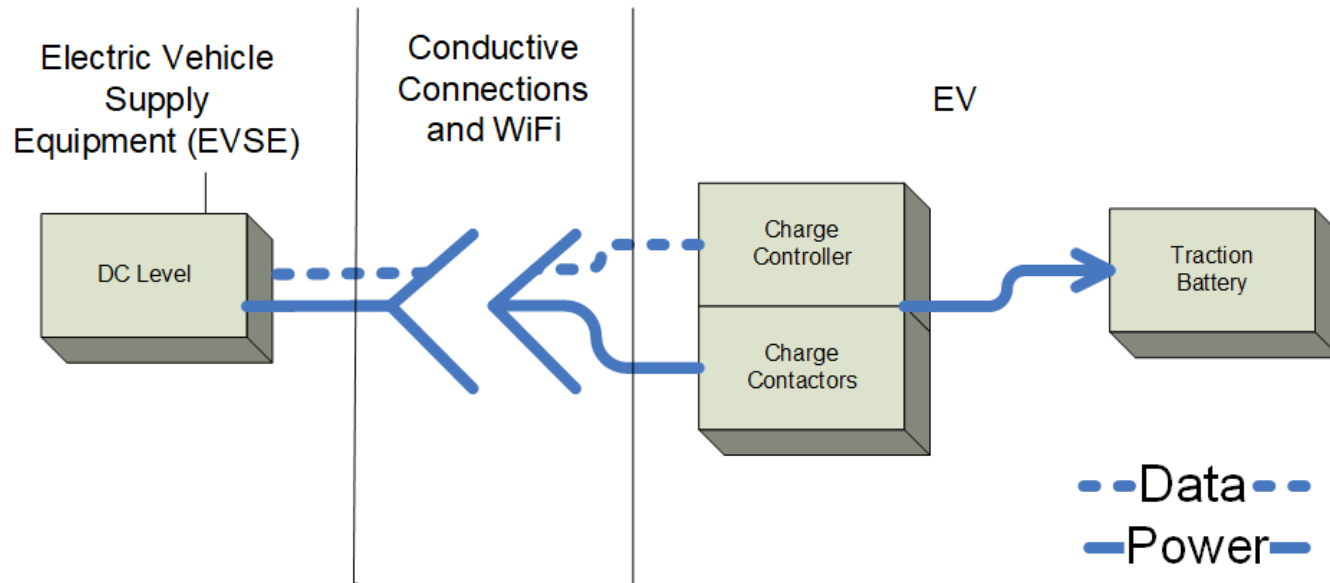
SAE Automatic Charging Recommended Practice

Article has been published in this months SAE Automotive Engineering Magazine



SAE Automatic Charging Recommended Practice

- Automatic Charging Connection at High Power- SAE J-3105
 - Documents are “Recommended Practices” that define the interface electrically and physically between the infrastructure and the vehicle
 - The document is for buses or heavy-duty vehicles, in general.



Requirements include:

Power Levels

Power Configurations

Communications

Safety

Connection Points

Alignment Protocol

J-3105 Meetings and Timing

- The committee meets twice a month on the 2nd and 4th Thursday at 11 am ET by WebEx
- Regular attendance is about 20 to 25 experts
- The committee has had four 2-day Face to Face meetings over two years- the latest was in March
- The committee has a two-day Face to Face meeting at the SAE Headquarters in Troy, Michigan in late July
- Assuming the SAE First Ballot begins in September 2018, the final published version should occur in the 1st Quarter 2019

J-3105 Regular Participants include:

Major Bus Manufacturers

Gillig
New Flyer
Nova Bus
Opbrid
Proterra

Pantograph and Connector Manufacturers

Furrer-Frey
Proterra
Schunk
Staubli
Stemmann

Transit Fleets

APTA
Chicago Transit
King County Metro
LA Transit
New York City Transit

Charger Manufacturers

ABB
Heliox
Siemens
Toshiba

Utilities

EPRI
Sacramento (SMUD)
Southern Cal Edison
(SCE)

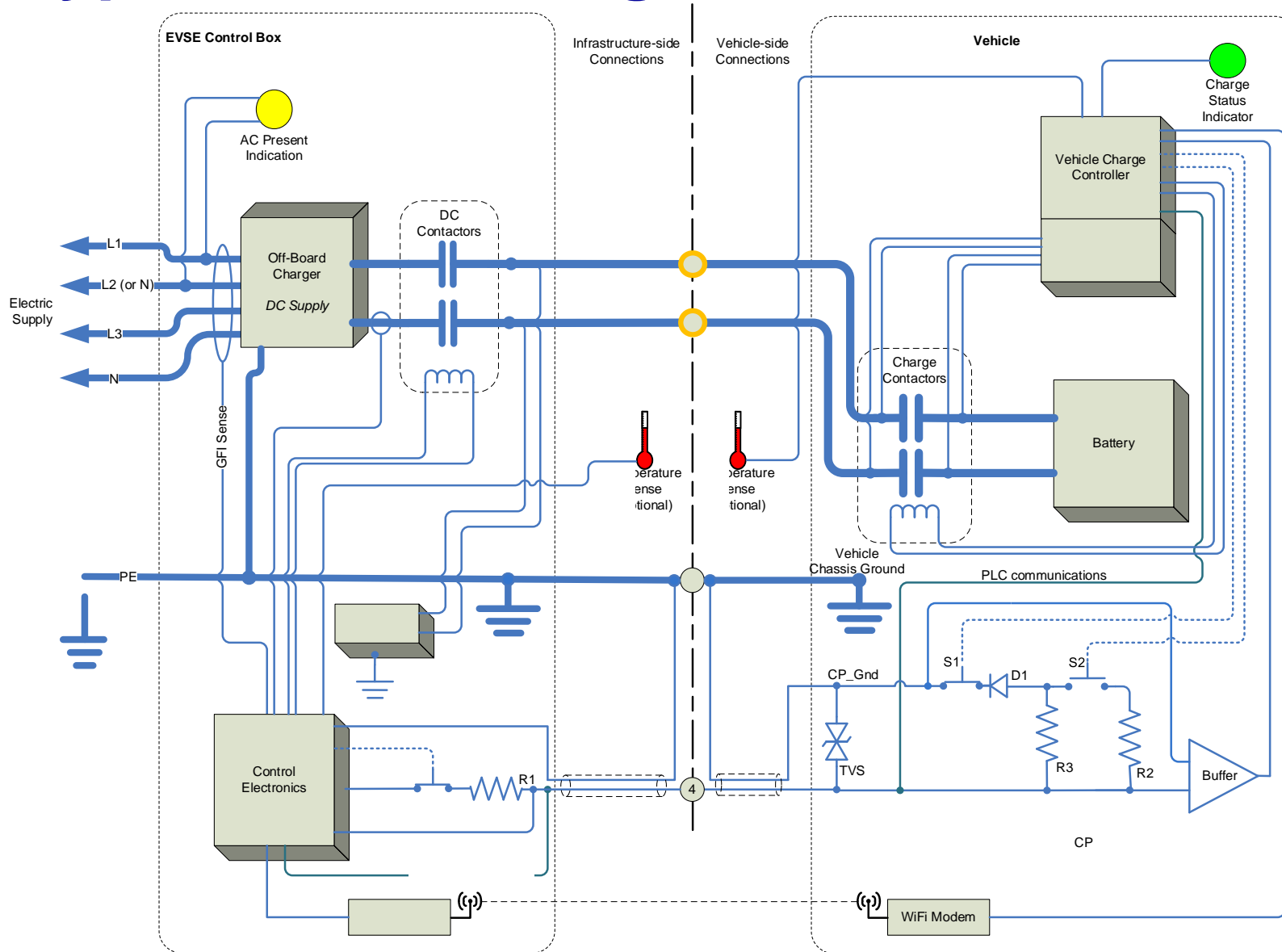
Others

ANL
CalStart
CEC
CTE

J3105 Recommended Practice

- The Recommended Practice will be produced as a family of documents connected together by a main document.
- The main document J-3105 will contain the significant common parts of the system (about 90%). It will include:
 - Electrical Interface
 - Power Flow (Voltage and Currents)
 - Communications
 - Safety
 - Systems
- The 4 sub-documents J-3105-1, J3105-2, etc. will detail the different connections and the unique parts including connection locations and alignment.

Typical Circuit Diagram



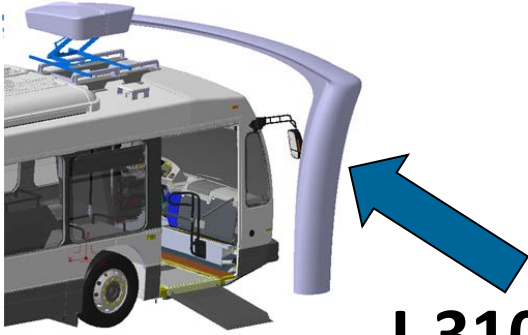
Four Interface Connections are defined:

1. DC Power (Plus)
2. DC Power (Negative)
3. Ground
4. Control Pilot

Automatic Charging Requirements

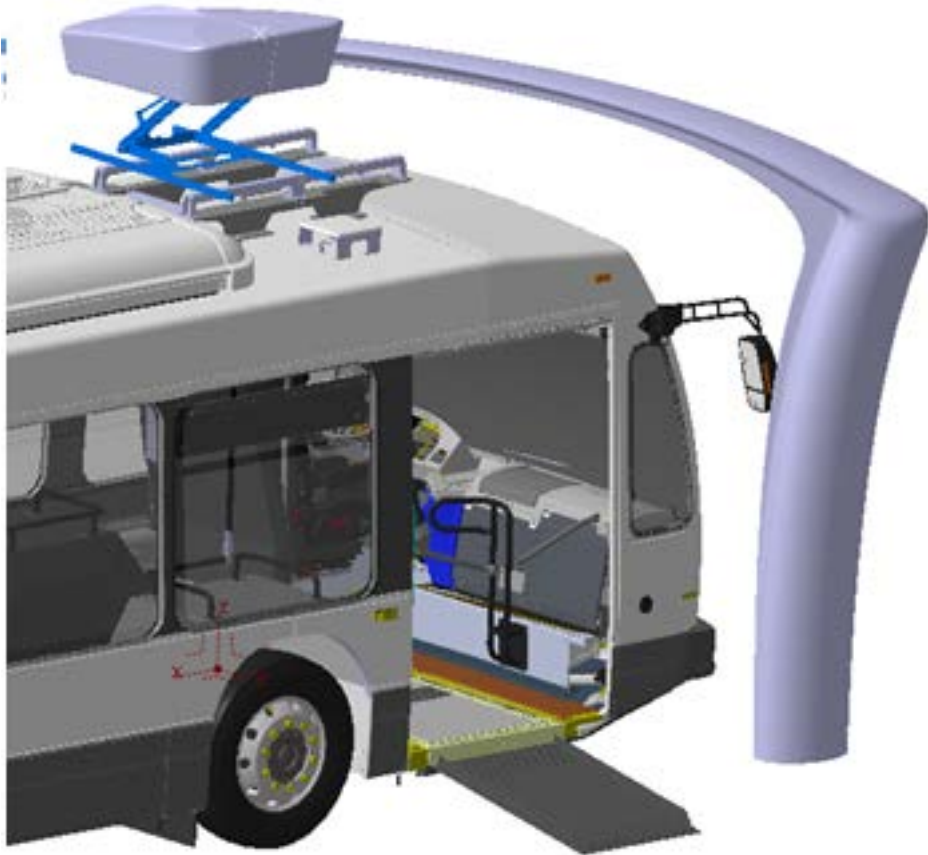
- The Voltage Range is 250 to 1000 V
- Two Power Levels are being considered-
 - Level 1: up to 600 A (350 kW)
 - Level 2: up to 1200 A (1200 kW)
 - Level 1 and Level 2 need to be compatible and interoperable
- Wireless communications will be used to pair the vehicle with the charger- IEEE 802.11n
- The Control Pilot will be used for communications once the vehicle is connected to the infrastructure

J-3105 Sub-Document Definition

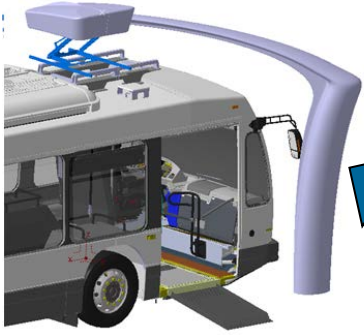


J-3105-1 - Infrastructure-mounted Cross Rail Connection

J-3105-1 Infrastructure-mounted Cross Rail Connection



J-3105 Sub-Document Definition

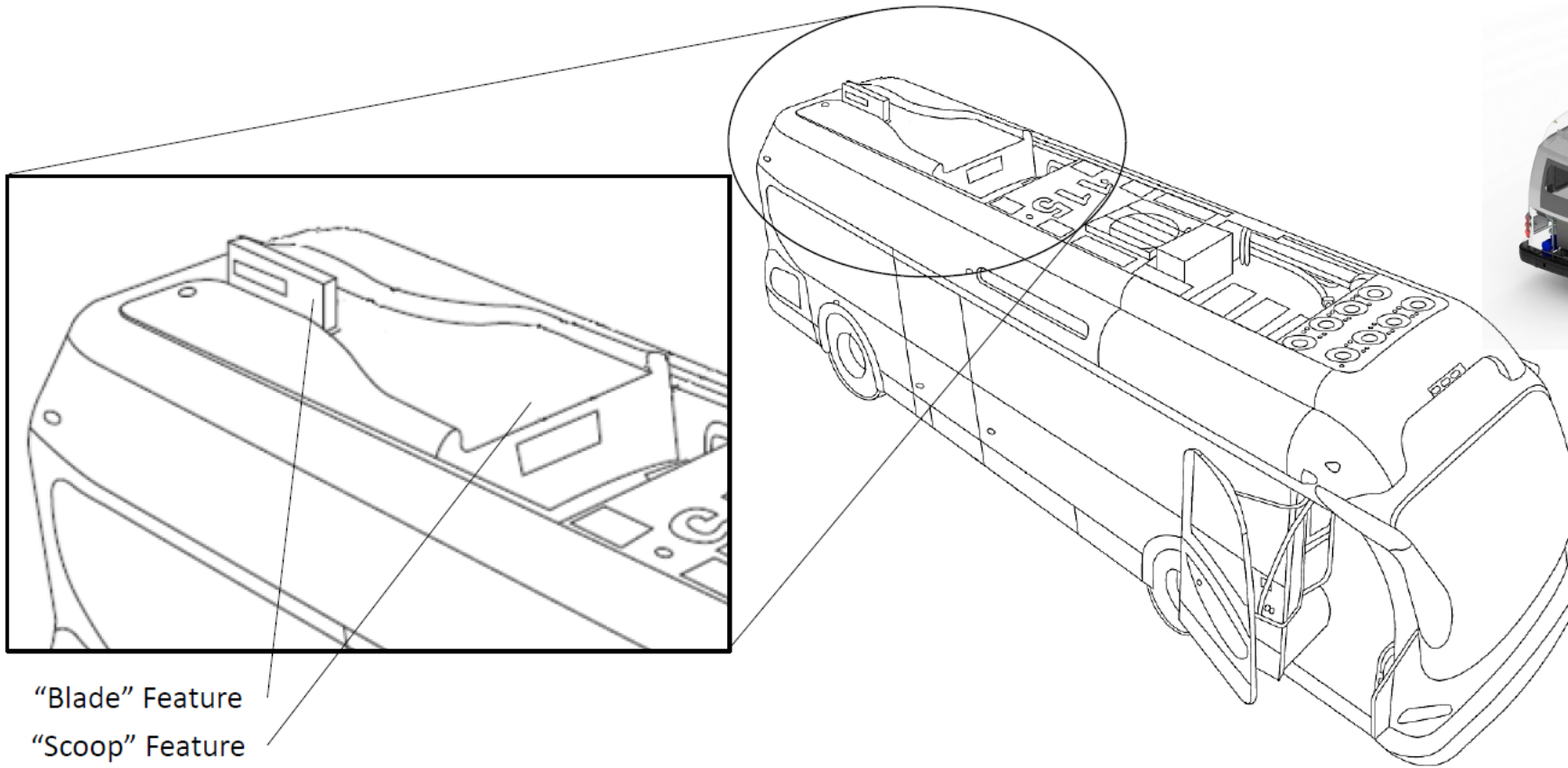


J-3105-1 - Infrastructure-mounted Cross Rail Connection



J-3105-2 - Infrastructure-mounted Blade Connection

J-3105-2 Infrastructure-mounted Blade Connection



"Blade" Feature
"Scoop" Feature

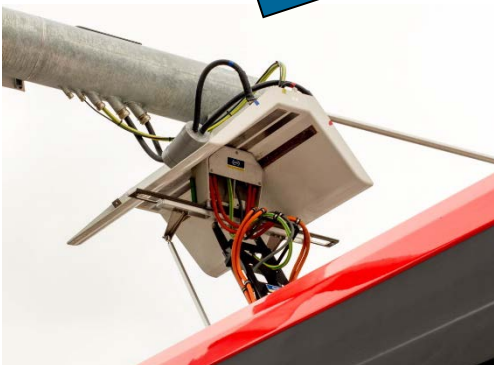
J-3105 Sub-Document Definition



J-3105-1 - Infrastructure-mounted Cross Rail Connection

J-3105-2 - Infrastructure-mounted Blade Connection

J-3105-3 - Vehicle-mounted Pantograph Connection



J-3105-3 Vehicle-Mounted Pantograph Connection



J-3105 Sub-Document Definition



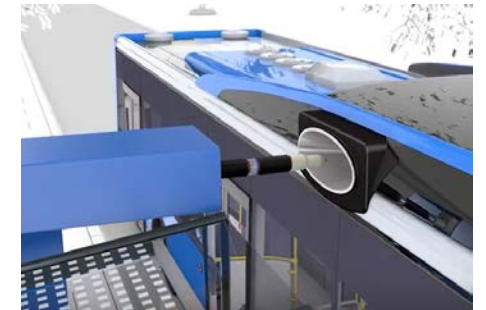
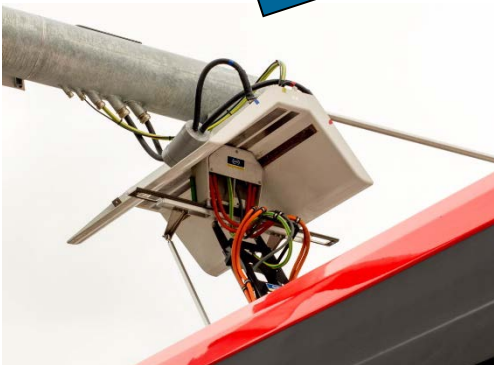
J-3105-1 - Infrastructure-mounted Cross Rail Connection



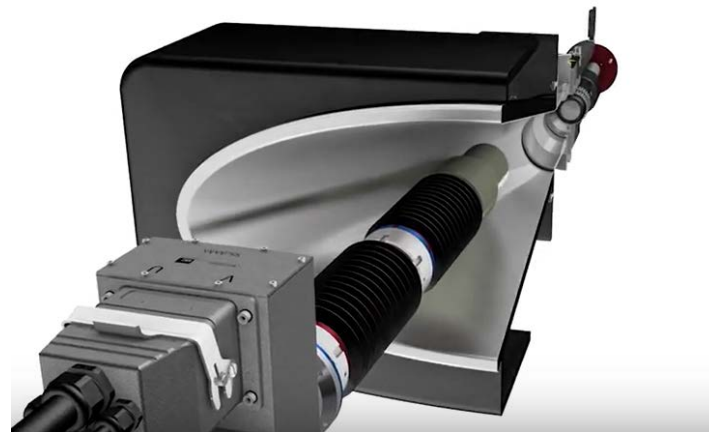
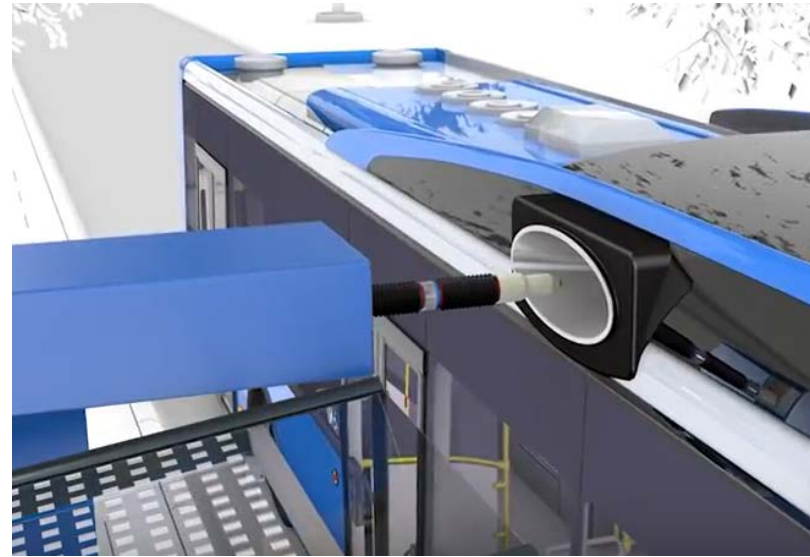
J-3105-2 - Infrastructure-mounted Blade Connection

J-3105-3 - Vehicle-mounted Pantograph Connection

J-3105-4 - Enclosed Pin and Socket Connection



J-3105-4 Enclosed Pin and Socket Connection



J-3105 Sub-Document Definition

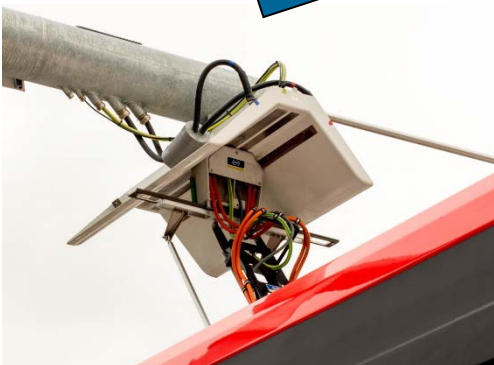


J-3105-1 - Infrastructure-mounted Cross Rail Connection

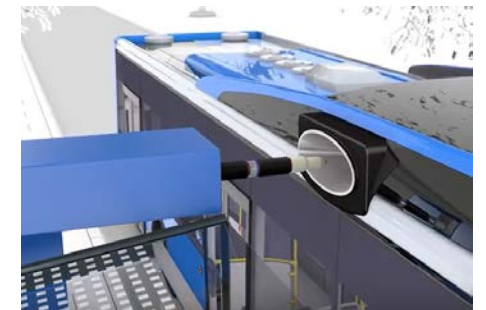
J-3105-2 - Infrastructure-mounted Blade Connection

J-3105-3 - Vehicle-mounted Pantograph Connection

J-3105-4 - Enclosed Pin and Socket Connection



1. Scope
2. Conductor Dimensions and Spacing
3. Alignment Procedure



Summary

- The SAE Recommended Practice is planned to be published in the 1st Qtr of 2019
- A family of documents will be published
 - J-3105 Main Document- including most requirements
 - 4 Sub-documents
 - J-3105-1 - Infrastructure-mounted Cross Rail Connection
 - J-3105-2 - Infrastructure-mounted Blade Connection
 - J-3105-3 - Vehicle-mounted Pantograph Connection
 - J-3105-4 - Enclosed Pin and Socket Connection
- SAE planning on publishing article in SAE Magazine in June

Thank You

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SAE High Power Charging Documents

Manual DC connection at high power- SAE J-1772 CCS

An existing document that will make provisions for the higher power (1000V, 350A, 350 kW) needs of the buses

Manual 3 phase AC at high power- SAE J-3068

Recently published document that is getting good acceptance

Wireless connection at high power- SAE J-2954-2

A developing document that will make provisions for the higher power needs of the buses

Automatic Charging at high power- SAE J-3105

Document planned to be published in early 2019

J-1772 CCS- 7th Revision

CURRENT **REVISED** 2017-10-13

SAE Electric Vehicle and Plug in Hybrid Electric Vehicle Conductive Charge Coupler

J1772_201710

This SAE Standard covers the general physical, electrical, functional and performance requirements to facilitate conductive charging of EV/PHEV vehicles in North America. This document defines a common EV/PHEV and supply equipment vehicle conductive charging method including operational requirements and the functional and dimensional requirements for the vehicle inlet and mating connector.

[Revision History](#)

[Related Info](#)

J1772_201710	2017-10-13	Latest	Revised	
J1772_201602	2016-02-03	Historical	Revised	



What's New with J1772?

- Described State B1 (EVSE Not Ready to Supply Power)
- Removed current tolerance (offset and % error) from pilot description
- DC Pin Current capacity raised to 400A
- DC Pin Voltage capacity now 50V to 1000V
- Updated Appendix H (Draft coupler performance certification test procedure)

J-3068 3 Phase AC Charging Connector

CURRENT **ISSUED** 2018-04-25

Electric Vehicle Power Transfer System Using a Three-Phase Capable Coupler J3068_201804

This document covers the general physical, electrical, functional, testing, and performance requirements for conductive power transfer to an Electric Vehicle using a Coupler capable of, but not limited to, transferring three-phase AC power. It defines a conductive power transfer method including the digital communication system. It also covers the functional and dimensional requirements for the Electric Vehicle Inlet, Supply Equipment Connector, and mating housings and contacts. Moveable charging equipment such as a service truck with charging facilities are within scope. Charging while moving (or in-route-charging) is not in scope.

[Revision History](#)

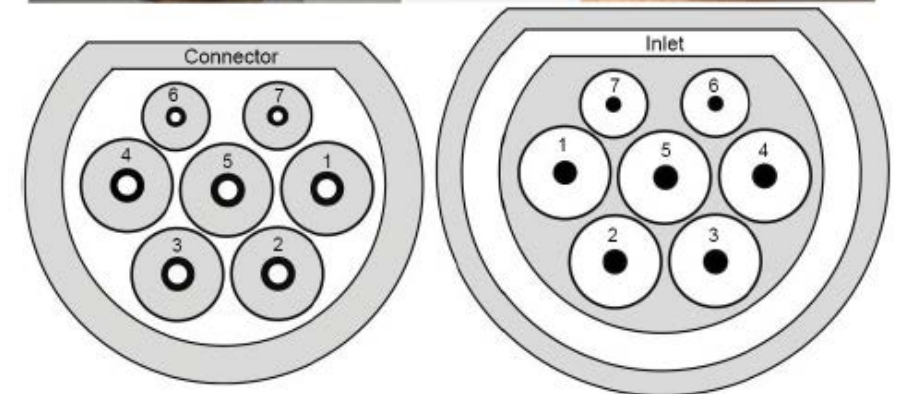
[Related Info](#)

J3068_201804

2018-04-25

Latest

Issued



J-2954-2 High Power Wireless Charging

SAE TIR J2954/2 HEAVY DUTY Power Classes

WPT5	WPT6	WPT7	WPT8
60kW	180kW	295kW	590kW

- 85% efficiency is used as a basis for the calculation of power class.
- Future revisions of J2954-2 may extend WPT power classes up to 1MW



- Recommended Practice to be published in 2020