



SURFACE VEHICLE RECOMMENDED PRACTICE	J3068™	SEP2024
	Issued	2018-04
	Revised	2024-09
Superseding J3068 JUL2022		
(R) Electric Vehicle Power Transfer System Using a Three-Phase Capable Coupler		

RATIONALE

This document has been revised to better support installations for refrigerated trucks and other medium-duty and heavy-duty vehicles for North American application, provide universal AC power transfer using a socket-outlet with carry-along cable assemblies across all vehicle classes, harmonize with SAE J3400 for single-phase application, and fix known errata in the document.

FOREWORD

SAE J3068 is a recommended practice for conductive charging of electric vehicles and supply equipment that may be capable of utilizing three-phase AC power. Presenting a symmetric three-phase load enhances grid stability, especially at high power levels. SAE J3068 standardizes an AC three-phase-capable charging coupler and digital control protocols, offering sufficient power and reliability for the commercial vehicle market. Existing technology is combined to provide higher power than existing charging solutions from the passenger car sector, with added diagnostics. SAE J3068's LIN-CP is harmonized with IEC 61851-1, Annex D. DC charging on separate contacts with PLC controls is also described, as is AC charging with PWM controls.

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For more information on this standard, visit https://www.sae.org/standards/content/J3068_202409/

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Standard, visit Sharing Hub

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1. SCOPE

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.

2. REFERENCES

2.1 General

This document specifies requirements and solutions for (but not limited to):

- Three-phase AC charging (constant voltage) using a conductive electrical coupler with seven contacts. It also gives requirements for providing single-phase and DC power transfer.
- Globally focused usage of a baseband digital communication method (LIN-CP) over the control pilot circuit to allow use of different grid voltage levels, currents, and grid topologies. An electrical compatibility check is done before energizing the power supply.
- Universal socket-outlet for utilizing AC power transfer. This approach provides a universal socket-outlet where a fully detachable carry-along EV cable assembly that provides one type of plug on the infrastructure side and one of three connectors (SAE J3068, SAE J1772, or SAE J3400) is mated with the inlet on the vehicle side.

2.2 Document Overview

Defined terms used in this document are shown in *italic* font. See [8.3](#) for related formatting specifications for signal names and values.

All requirements are given level-four section numbers, and appear in the text from [Sections 5](#) through [10](#). See [5.1.1.1](#) as an example of one of the first requirements.

[Section 5](#) gives requirements for the conductive electrical coupler and general charging requirements.

[Section 6](#) defines the control pilot circuit, which is similar to the circuits defined in SAE J1772 and SAE J3400. The primary difference is that the PWM signaling is replaced with, or supplemented by, baseband digital communication signals (LIN bus, Local Interconnect Network). The control pilot communicates system status, available voltage and currents, etc.

[Section 7](#) defines the coupler proximity circuit.

[Section 8](#) defines the LIN communication protocol.

[Sections 9](#) and [10](#) define the application program.

[Appendix A](#) shows examples of startup and shutdown sequences and gives an overview of hardware status and LIN communication signal values.

[Appendix B](#) provides requirements for SAE universal socket-outlet AC power transfer.

[Appendix C](#) provides requirements and clarifying examples for using single-phase couplers.

[Appendix D](#) shows a summary of LIN signals, frames, and schedules.

[Appendix E](#) links to a reference implementation including an example of a LIN definition file (LDF file).

[Appendix F](#) provides assistance in managing asymmetric SE current limits for an EV that loads from line-to-line.

[Appendix G](#) summarizes requirements (all of which have four-level section numbers) and provides links to explanatory text in context to assist verification planning.

2.3 Applicable Documents

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.3.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

SAE J1211	Handbook for Robustness Validation of Automotive Electrical/Electronic Modules
SAE J1772	SAE Electric Vehicle and Plug-in Hybrid Electric Vehicle Conductive Charge Coupler
SAE J2012	Diagnostic Trouble Code Definitions
SAE J3068/1	Identification of Vehicles and Supply Equipment for Conductive AC Charging
SAE J3068/2	Control of Bidirectional Power for AC Conductive Charging
SAE J3400	NACS Electric Vehicle Coupler

2.3.2 ANSI Accredited Publications

Copies of these documents are available online at <https://webstore.ansi.org/>.

ANSI C84.1	Electric Power Systems and Equipment - Voltage Ratings (60 Hz)
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2.3.3 California Code of Regulations Publications

Copies of these documents are available online at <https://oal.ca.gov/>.

13 CCR § 1971.1	On-Board Diagnostic System Requirements – 2010 and Subsequent Model-Year Heavy-Duty Engines.
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2.3.4 CSA Publications

Available from CSA International, 178 Rexdale Boulevard, Toronto, Ontario, Canada M9W 1R3, Tel: 416-747-4000, www.csa-international.org.

CSA C22.1	Canadian Electrical Code Part 1, Section 86
CSA C22.2 NO. 280	Electric Vehicle Supply Equipment
CSA C22.2 NO. 281.1	Standard for Safety for Personnel Protection Systems for Electric Vehicle (EV) Supply Circuits: General Requirements
CSA C22.2 NO. 281.2	Standard for Safety for Personnel Protection Systems for Electric Vehicle (EV) Supply Circuits: Particular Requirements for Protection Devices for Use in Charging Systems
CSA C22.2 NO. 282	Plugs, Receptacles, and Couplers for Electric Vehicles

2.3.5 DIN Publications

Copies of these documents are available online at <https://www.din.de/en/>.

DIN SPEC 70121	Electromobility - Digital communication between a d.c. EV charging station and an electric vehicle for control of d.c. charging in the Combined Charging System
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2.3.6 IEC Publications

Available from IEC Central Office, 3, rue de Varembe, P.O. Box 131, CH-1211 Geneva 20, Switzerland, Tel: +41 22 919 02 11, www.iec.ch.

- IEC 60664-1 Insulation Coordination for Equipment within Low-Voltage Supply Systems - Part 1: Principles, Requirements and Tests
- IEC 61851-1 Electric Vehicle Conductive Charging System - Part 1: General Requirements
- IEC 62196-1 Plugs, Socket-Outlets, Vehicle Connectors and Vehicle Inlets - Conductive Charging of Electric Vehicles - Part 1: General Requirements
- IEC 62196-2 Plugs, Socket-Outlets, Vehicle Connectors and Vehicle Inlets - Conductive Charging of Electric Vehicles - Part 2: Dimensional Compatibility and Interchangeability Requirements for AC Pin and Contact-Tube Accessories
- IEC 62196-3 Plugs, Socket-Outlets, Vehicle Connectors and Vehicle Inlets - Conductive Charging of Electric Vehicles - Part 3: Dimensional Compatibility and Interchangeability Requirements for DC and AC/DC Pin and Contact-Tube Vehicle Couplers

2.3.7 IEEE Publications

Available from IEEE Operations Center, 445 and 501 Hoes Lane, Piscataway, NJ 08854-4141, Tel: 732-981-0060, www.ieee.org.

- IEEE 100 CD Standards Dictionary: Glossary of Terms and Definitions

2.3.8 ISO Publications

Available from International Organization for Standardization, ISO Central Secretariat, 1, ch. de la Voie-Creuse, CP 56, CH-1211 Geneva 20, Switzerland, Tel: +41 22 749 01 11, www.iso.org.

- ISO 15118-3 Road vehicles - Vehicle to grid communication interface - Part 3: Physical and data link layer requirements
- ISO 17987-1 Road Vehicles - Local Interconnect Network (LIN) - Part 1: General Information and Use Case Definition
- ISO 17987-2 Road Vehicles - Local Interconnect Network (LIN) - Part 2: Transport Protocol and Network Layer Services
- ISO 17987-3 Road Vehicles - Local Interconnect Network (LIN) - Part 3: Protocol Specification
- ISO 17987-4 Road Vehicles - Local Interconnect Network (LIN) - Part 4: Electrical Physical Layer (EPL) Specification 12V/24V
- ISO/TR 17987-5 Road Vehicles - Local Interconnect Network (LIN) - Part 5: Application Programmers Interface (API)
- ISO 17987-6 Road Vehicles - Local Interconnect Network (LIN) - Part 6: Protocol Conformance Test Specification
- ISO 17987-7 Road Vehicles - Local Interconnect Network (LIN) - Part 7: Electrical Physical Layer (EPL) Conformance Test Specification

NOTE: LIN Specification 2.2.A (2010) from the LIN consortium (<http://www.lin-subbus.org/>) has been discontinued and transcribed to ISO 17987 Parts 1-7.

2.3.9 NFPA Publications

Available from National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471, Tel: 617-770-3000, www.nfpa.org.

NFPA 70 National Electrical Code

2.3.10 Normas Mexicanas

Available from Sistema Integral de Normas y Evaluación de la Conformidad (SINEC), Insurgentes Sur 1735, Col. Guadalupe Inn., Delegación Alvaro Obregón, México, D.F. C.P. 01020, Tel: (01)-(55)-2000-3000, www.gob.mx.

NOM-001-SEDE Instalaciones Electricas (Utilización) Artículo 625

NMX-J-668/1-ANCE Vehículos eléctricos (VE) - Sistemas de protección personal para circuitos de alimentación - Parte 1: Requisitos generales

NMX-J-668/2-ANCE Vehículos eléctricos (VE) - Sistemas de protección personal para circuitos de alimentación - Parte 2: Requisitos particulares para dispositivos de protección para utilizarse en sistemas de carga

NMX-J-677-ANCE Vehículos eléctricos - Equipos de alimentación

NMX-J-678-ANCE Vehículos eléctricos - Clavijas, receptáculos y acopladores

2.3.11 UL Publications

Available from UL, 333 Pfingsten Road, Northbrook, IL 60062-2096, Tel: 847-272-8800, www.ul.com.

UL 943 Ground-Fault Circuit-Interrupters

UL 2231-1 Personnel Protection Systems for Electric Vehicle Supply Circuits: General Requirements

UL 2231-2 Personnel Protection Systems for Electric Vehicle Supply Circuits: Particular Requirements for Protection Devices for Use in Charging Systems

UL 2251 Plugs, Receptacles, and Couplers for Electric Vehicles

UL 2594 Electric Vehicle Supply Equipment

2.4 Related Publications

The following publications are provided for information purposes only and are not a required part of this SAE Technical Report.

2.4.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

SAE J551-5 Performance Levels and Methods of Measurement of Magnetic and Electric Field Strength from Electric Vehicles, 150 kHz to 30 MHz

SAE J1113-21 Electromagnetic Compatibility Measurement Procedure for Vehicle Components - Part 21: Immunity to Electromagnetic Fields, 30 MHz to 18 GHz, Absorber-Lined Chamber

SAE J1742 Connections for High Voltage On-Board Vehicle Electrical Wiring Harness - Test Methods and General Performance Requirements

- SAE J1812 Function Performance Status Classification for EMC Immunity Testing
- SAE J2847-2 Communication Between Plug-in Vehicles and Off-Board DC Chargers
- SAE J2894-1 Power Quality Requirements for Plug-In Electric Vehicle Chargers
- SAE J2931-1 Digital Communications for Plug-in Electric Vehicles
- SAE J2931-4 Broadband PLC Communication for Plug-in Electric Vehicles
- SAE J3072 Interconnection Requirements for Onboard, Grid Support Inverter Systems

2.4.2 Code of Federal Regulations (CFR) Publications

Copies of these documents are available online at <https://www.ecfr.gov>.

- 40 CFR Part 600 Fuel Economy and Greenhouse Gas Exhaust Emissions of Motor Vehicles
- 47 CFR Part 15, Subpart A Radio Frequency Devices, General
- 47 CFR Part 15, Subpart B Radio Frequency Devices, Unintentional Radiators
- 47 CFR Part 18, Subpart C Industrial, Scientific, and Medical Equipment, Technical Standards

2.4.3 IEC Publications

Available from IEC Central Office, 3, rue de Varembe, P.O. Box 131, CH-1211 Geneva 20, Switzerland, Tel: +41 22 919 02 11, www.iec.ch.

- CISPR 12 Vehicles, Boats and Internal Combustion Engines - Radio Disturbance Characteristics - Limits and Methods of Measurement for the Protection of Off-Board Receivers
- IEC 61000-4-3 Electromagnetic Compatibility (EMC) - Part 4-3: Testing and Measurement Techniques - Radiated, Radio-Frequency, Electromagnetic Field Immunity Test
- IEC 61000-4-6 Electromagnetic Compatibility (EMC) - Part 4-6: Testing and Measurement Techniques - Immunity to Conducted Disturbances, Induced by Radiofrequency Fields

2.4.4 ISO Publications

Available from International Organization for Standardization, ISO Central Secretariat, 1, ch. de la Voie-Creuse, CP 56, CH-1211 Geneva 20, Switzerland, Tel: +41 22 749 01 11, www.iso.org.

- ISO 11451-2 Road Vehicles - Vehicle Test Methods for Electrical Disturbances from Narrowband Radiated Electromagnetic Energy - Part 2: Off-Vehicle Radiation Sources

2.4.5 Swedish Standard Institute Publications

Available from the Swedish Standard Institute, SE-118 80 Stockholm, Sweden, Tel: +46-8-555-523-00, www.sis.se.

- SEK TS 4810515 Electric Vehicle Conductive Charging System - Control Pilot Function that Provides CAN Communication Using the Control Pilot Circuit

2.4.6 UL Publications

Available from UL, 333 Pfingsten Road, Northbrook, IL 60062-2096, Tel: 847-272-8800, www.ul.com.

UL 50	Standard for Enclosures for Electrical Equipment
UL 62	Flexible Cord and Fixture Wire
UL 94	Tests for Flammability of Plastic Materials for Parts in Devices and Appliances
UL 231	Power Outlets
UL 746A	Standard for Polymeric Materials - Short Term Property Evaluations
UL 840	Insulation Coordination Including Clearance and Creepage Distances for Electrical Equipment
UL 1439	Determination of Sharpness of Edges on Equipment

3. DEFINITIONS

3.1 API

Application Programming Interface.

3.2 APPLICATION PROGRAM

The implementation of the *control sequence* on an *EV* or *SE*.

3.3 CABLE ASSEMBLY, EV

A portable *cable assembly* consisting of a length of *EV cable*, a vehicle *connector* on one end, and an *EV plug* on the other.

3.4 CASE A

The *EV* connects to the *SE* via a cable permanently attached to the *EV*.

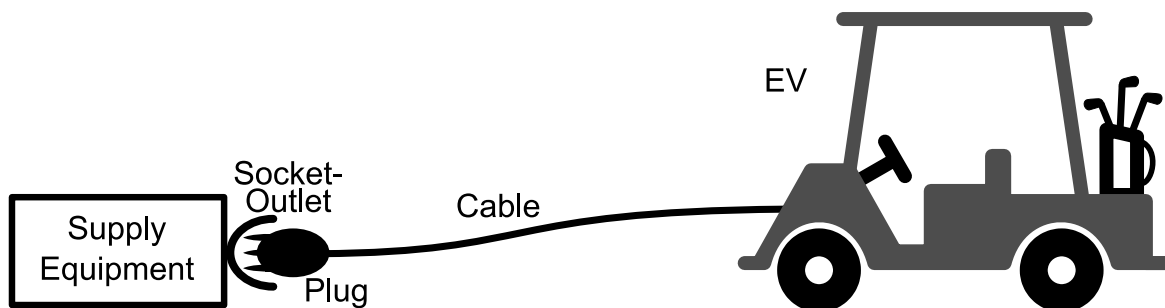


Figure 1 - Case A: Charging cord attached to vehicle

3.5 CASE B

The *EV* connects to the *SE* via an *EV cable assembly* that is detachable by the driver at both ends.

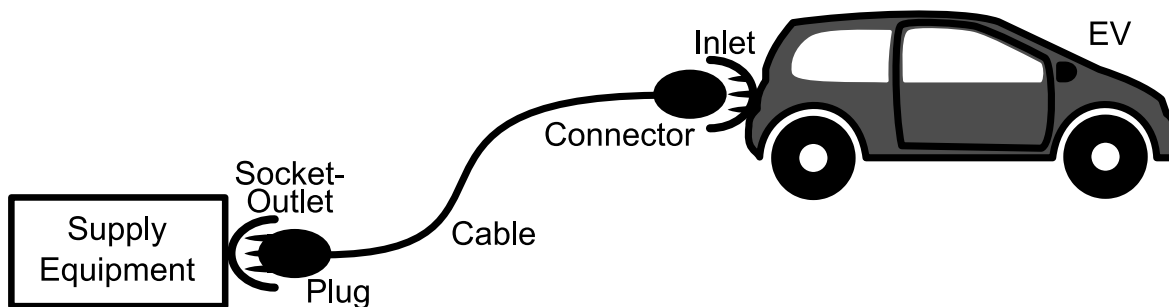


Figure 2 - Case B: Fully detachable EV cable assembly

3.6 CASE C

EV connects to the SE via a *connector* permanently attached to the SE.

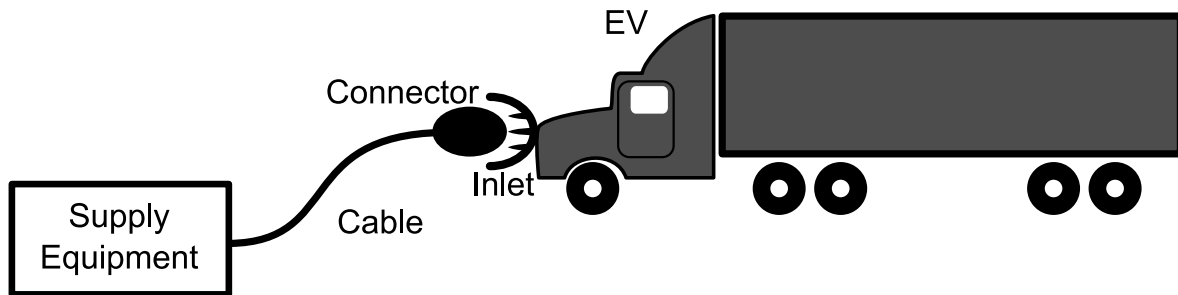


Figure 3 - Case C: Connector permanently attached to SE

3.7 CCID

Charging circuit interruption device, as defined in the *Tri-National EVSE Safety Standards*. A CCID interrupts the charging circuit if differential current exceeds a threshold, usually 20 mA for permanently wired installations. AC and DC thresholds are specified, and automatic reclosure is allowed under certain conditions. Contrast to UL 943 for *ground* fault circuit interrupters.

3.8 CHARGER

An electrical device that converts alternating current energy to regulated direct current for replenishing the energy of a rechargeable energy storage device (i.e., battery) and may also provide energy for operating other vehicle electrical systems.

3.9 CHASSIS GROUND

The *conductor* used to connect the non-current carrying metal parts of the EV high voltage system to the *equipment ground*. See [3.25](#).

3.10 COMBINED CHARGING SYSTEM (CCS)

A system where dedicated DC contacts are added to AC charging *couplers*. CCS1 refers to SAE J1772 (IEC 62196-2 type 1) *couplers* with DC functionality added. CCS1 is called “configuration EE” in IEC 62196-3 and “DC Level 2” in SAE J1772. CCS2 refers to SAE J3068 (IEC 62196-2 type 2) *couplers* with DC functionality added. CCS2 is called “configuration FF” in IEC 62196-3 and “SAE J3068 DC₈” in SAE J3068. CCS *couplers* may or may not include AC contacts. CCS *connectors* always use a *case C* (*connector* fixed to the EVSE).

3.11 CONDUCTOR

A body, usually in the form of a wire, cable, or bus bar, suitable for carrying an electric current. Refer to IEEE 100 CD.

3.12 CONNECTION SESSION

A *connection session* starts when the *connector* is inserted into the *inlet* and ends when the *connector* is removed from the *inlet*. A normal *connection session* may contain one or more periods of charging.

3.13 CONNECTOR

A hand-held conductive device at the end of a flexible cable from the SE, which is inserted into the EV *inlet* to charge the battery.

3.14 CONTACTOR

A switching device capable of repeatedly interrupting normal load currents, but not necessarily rated to interrupt short circuit current as a circuit breaker would. A *contactor* is similar in concept to a relay, but generally has higher power capacity. (Relays “click,” *contactors* “clunk.”) “*Contactor*” may also refer to a high-power (and silent) solid-state relay.

3.15 CONTROL PILOT (CP)

An electrical signal that is sourced by the *SE*, controlled by the *EV* and the *SE*, and used for the following functions:

- a. Verifies that the *EV* and *SE* are present and connected
- b. Controls energization/de-energization of the charging power supply
- c. Transmits operating parameters and constraints between *SE* and *EV*
- d. Monitors the presence of the *equipment ground*

3.16 CONTROL SEQUENCE

A sequence of automated *tasks* performed by the *EV* and the *SE* during a *connection session* for the purpose of charging the *EV*. A new *control sequence* occurs at the beginning of a *connection session* and after a *restart*. See [Section 10](#).

3.17 COUPLER, EV

A physical and electrical mating system connecting the *SE* to the *EV*. The *coupler* includes the *connector* at the end of the flexible cable of the *SE*, and the *inlet* on the *EV*.

3.18 CP LEVEL

Control pilot level refers to the nominal high-level voltage of the *control pilot* waveform (during *LIN-CP*). This voltage is a function of the *EV* being plugged in or unplugged and of the *EV* closing or opening the switch S_2 ; see [Figure 11](#). *CP level* is denoted as 12, 9, 6, etc.; see [Table 9](#).

“*CP level*” is similar to “*State*” in SAE J1772, but not identical. The negative amplitude differs (-12 V for *PWM-CP* and approximately 0 V for *LIN-CP*). The analog control function of S_2 is supplemented by digital *signals*; see [Figure 10](#).

3.19 DATA LINK

In general, a digital communication bus such as *LIN*, *CAN*, *Ethernet*, *PLC*, *fiber optic*, *Wi-Fi*, etc. The specific *data link* described in this recommended practice is *LIN*.

3.20 DELTA CONNECTED LOAD (also Δ LOAD)

A three-wire type of three-phase connection, the three corners of the delta or triangle, as diagrammatically represented, being connected to the three wires of the circuit. Contrast to *wye connected load*. See [3.62](#).

3.21 ELECTRIC VEHICLE (EV)

A vehicle designed to receive energy from an *SE*. This term is used to cover *electric vehicles* and plug-in hybrid *electric vehicles*. This includes on-road *electric vehicles*, off-road *electric vehicles*, airport ground support equipment, etc.

3.22 ELECTRIC VEHICLE SUPPLY EQUIPMENT (EVSE)

A device responsible for safely providing power to the *EV* through the use of certain control functions which are defined in this recommended practice and is listed according to the *Tri-National AC EVSE Standard*. It may be permanently wired or connected via a cord to the premises wiring. To supply the *EV*, it may have a permanently attached cable and *connector*, or an *SE socket-outlet* (see [3.51](#)) which accepts a *plug* (see [3.41](#)). Contrast this with *SE* which does not encompass the connection method (see [3.55](#)).

3.23 EQUIPMENT GROUND

A *conductor* used to connect the non-current carrying metal parts of the *SE* to the system *grounding conductor*, the *grounding electrode conductor*, or both, at the *supply equipment*. See [3.25](#).

3.24 FRAME

A *LIN* communication entity consisting of a *header* and *response*. All *frames* in this document have 8 byte payloads.

3.25 GROUND CONDUCTOR (GROUNDING CONDUCTOR or GROUND)

A *conductor* which does not carry current under normal operating conditions, but is capable of carrying sufficient fault current to trip circuit protection such as a fuse or circuit breaker. Also known as Protective Earth outside of North America. See [3.9](#) for *EV ground* nomenclature and [3.23](#) for *SE ground* nomenclature.

3.26 HEADER

The first part of a *LIN frame* that contains a *frame* identifier to request a specific *response*. It is always sent by the commander *LIN* node.

3.27 INLET

The component on the *EV* into which the *connector* mates. This is part of the *coupler*.

3.28 kbps

Thousand bits per second.

3.29 LIN

Local Interconnect Network; refer to ISO 17987.

3.30 LIN-CP

The control method using *LIN signals* and *CP levels*, as described in this document.

3.31 LIN DEFINITION FILE (LDF)

A file that describes the nodes, *frames*, and *signals* of a *LIN* cluster and is used for automated node generation.

3.32 LINE CONDUCTOR (LINE)

A *conductor* that is not connected to the *neutral* point of a system that is intended to carry current under normal conditions.

3.33 LOCAL ELECTRICAL CODES

Refers to the regulations governing electrical installations in their corresponding jurisdictions: NFPA 70, CSA C22.1, or NOM-001-SEDE, and/or any applicable local regulations.

3.34 LOCK (UNLOCK)

The act of engaging or disengaging the *locking mechanism* (e.g., “lock the *inlet*” means “engage the *inlet*’s *locking mechanism*”).

3.35 LOCKING MECHANISM

A component associated with the *inlet* that, when engaged, prevents removal of the *connector*. The *locking mechanism* may be engaged for reasons related to safety, operational reliability, and/or tamper prevention. See [5.4.3](#) and [Sections 9](#) and [10](#).

3.36 MCU

Micro Controller Unit.

3.37 NEUTRAL CONDUCTOR (NEUTRAL)

The *conductor* connected to the *neutral* point of a system that is intended to carry current under normal conditions. Refer to NFPA 70 (National Electrical Code), Article 100.

3.38 NOT AVAILABLE

A special value for a *signal* that means that a value for this *signal* is *Not Available* or invalid, and should not be used in calculations or decisions. See *valid value* in [3.61](#).

3.39 ON-BOARD CHARGER

A *charger* located on the *electric vehicle*.

3.40 POWER-LINE CARRIER (PLC)

The supplementary communications mechanism defined in ISO 15118-3 and DIN SPEC 70121. A *PLC* modem facilitates this connection.

3.41 PLUG

A hand-held conductive component at one end of an *EV cable assembly* which mates into the *socket-outlet*; see *case B* (see [Figure 2](#)) and *case A* (see [Figure 1](#)). Not present in *case C* (see [Figure 3](#)).

3.42 PROTOCOL VERSION

The particular communications format in use. This document defines *Protocol Version 2*, and IEC 61851-1:2017, Annex D, defines *Protocol Version 1*. Future editions and/or companion documents may define additional *Protocol Versions*.

3.43 PROXIMITY DETECTION (PROXIMITY or PROX)

A method whereby the *EV* can ascertain whether a *connector* is plugged into the *inlet*, without requiring active elements in the *connector* or cable. *Proximity detection* may also provide additional functionality. See *proximity detection* ([Section 7](#)). This function is also used between the *plug* and the *socket-outlet*; see [Appendix B](#).

3.44 PUBLISHER

A *LIN* node which has been assigned to provide the *response* for a specific *frame*. Each *frame* can have only one *publisher*.

3.45 PWM

Pulse-width modulation.

3.46 PWM-CP

The control method using *PWM signals* and *CP levels*, as described in SAE J1772.

3.47 RESPONSE

The last part of a *LIN frame* that contains the *frame data* requested in the *header*. It is sent by the *LIN* node which is the *publisher* for the requested *response*.

3.48 RESTART

An event within a *connection session* where *LIN-CP* communication begins again in a new *control sequence*. See [Section 10](#).

3.49 S2

A means for the *EV* to change the *control pilot level* between levels 9 and 6.

3.50 SCHEDULE

The *schedule* describes the *frames* and the timing of the *frames* transmitted on the *data link*. See [8.2](#). Refer to ISO 17987-3.

3.51 SOCKET-OUTLET

The component on the *EVSE* into which the *plug* of an *EV cable assembly* is inserted. *Socket-outlets* only exists in *case A* (see [Figure 1](#)) and *case B* (see [Figure 2](#)) applications. The *SE* may instead have a permanently attached cable; see *case C* ([Figure 3](#)). These components are not general-purpose (e.g., NEMA) receptacles, but are instead specifically for *EVs*. These components are not used to provide a connection between the premises wiring and the *supply equipment*, but instead connect the *EV cable assembly* to the *supply equipment*.

3.52 SIGNAL

A datum communicated over the *LIN data link*. One or more *signals* are packaged in an 8 byte *frame*. In this recommended practice, most *signals* contain a minimum of 2 bits so that even a “binary” *signal* with normal values such as *Incomplete* and *Complete* can also indicate the values of *Error* and *Not Available* for exceptions. Parametric *signals* typically encode a range of data (for example, with 8 bits) with the maximum value encoding *Not Available*. See [3.61](#).

3.53 START VALUE

A value stored internally in a *LIN* node (usually referring to a *signal* from the other node) at the start of a *control sequence* before an actual *signal* is received from the other *LIN* node. *Start values* are sometimes defined to set safe start conditions or to set values that can be distinguished from *valid* received *values* (making it clear from the variable value when nothing has yet been received from the other side of the network).

3.54 SUBSCRIBER

A *LIN* node which has been assigned to receive the *response* for a specific *frame*. Each *frame* can have zero, one, or several *subscribers*.

3.55 SUPPLY EQUIPMENT (SE)

Supply equipment (also “Se...” in *signal* names and *frame* names). In this recommended practice, *supply equipment* does not encompass the connection method, which has distinct voltage and current ratings that are not necessarily reflected in the *SE* rating *signals*. Contrast this with *EVSE* (see [3.22](#)) which does encompass the connection method ratings in addition to the control box ratings.

3.56 TASK

There are three primary *tasks* in SAE J3068: *Protocol Version selection* (see [9.5](#)), *Initialization* (see [9.6](#)), and *Operation* (see [9.7](#)). Each *task* has a corresponding *LIN schedule* assigned to accomplish it.

3.57 TRI-NATIONAL AC EVSE STANDARD

Refers to the *EVSE* product standard in their corresponding jurisdictions: UL 2594, CSA C22.2 No. 280, or NMX-J-677-ANCE.

3.58 TRI-NATIONAL COUPLER STANDARD

Refers to the standards documents covering *plugs*, *socket-outlets*, *cable assemblies*, *connectors*, and *inlets* in their corresponding jurisdictions: UL 2251, CSA C22.2 No. 282, or NMX-J-678-ANCE.

3.59 TRI-NATIONAL EVSE SAFETY STANDARDS

Refers to the *EVSE* safety standards in their corresponding jurisdictions: UL 2231-1 and UL 2231-2, CSA C22.2 No. 281.1 and CSA C22.2 No. 281.2, or NMX-J-668/1-ANCE and NMX-J-668/2-ANCE.

3.60 UART

Universal asynchronous receiver/transmitter.

3.61 VALID VALUE

A *signal* value that is not set to *Not Available* (binary value of all ones) and not set to *Error*. In other words, a useable value that does not need to be ignored.

3.62 WYE CONNECTED LOAD (also Y LOAD)

Electrical loads (typically three loads) connected between *neutral* and a *line* (hot wire) of a three-phase AC supply. Contrast to *delta connected load* (also Δ load; see [3.20](#)).

4. DOCUMENT AND SYSTEM OVERVIEW

4.1 System Overview

Signaling and power flow for case C is shown in [Figure 4](#) (informative). The center green box encloses the systems which this recommended practice focuses on. A similar diagram for case B is shown in [Appendix B, Figure B1](#).

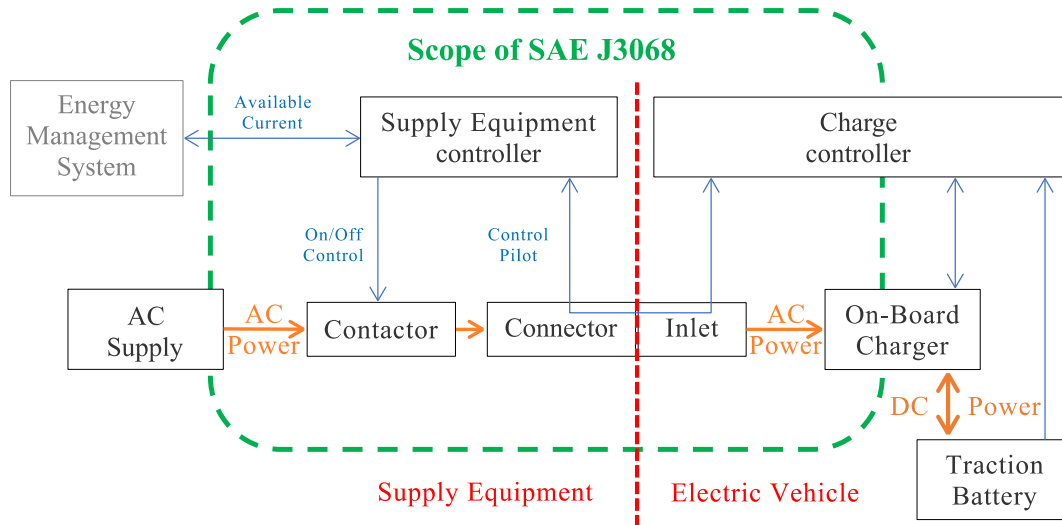
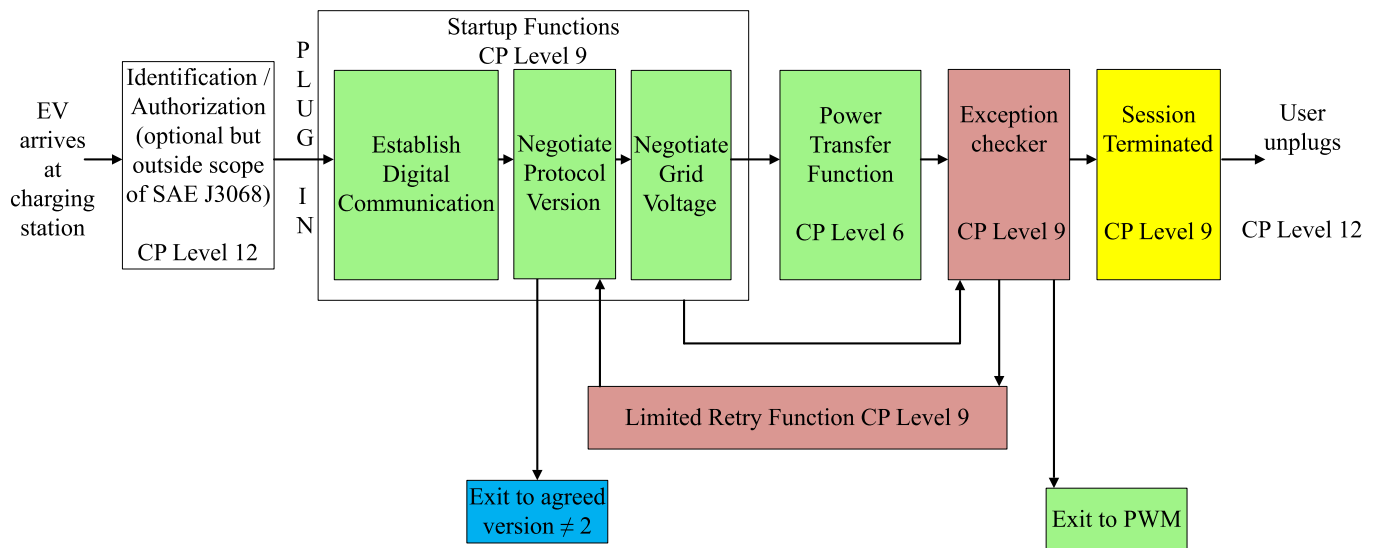


Figure 4 - General AC conductive charging system topology for case C

4.2 Functional Concept of Digital Control

The digital *control pilot* circuit enables the EV and SE to function as a system. There is ancillary control of the SE *contactor* via the EV's control of the positive voltage of the *control pilot* waveform (*CP level*). Only if the digital *signals* agree with the analog *CP level* will the *contactor* remain closed. The digital system functions may be visualized as in [Figure 5](#), where connection between the EV and SE occurs at the left, and the *connection session* ends at the right.

Allowed transitions between charging sequence functions



A normal charging session follows the horizontal path from left to right. Options (in scope) are above the normal path, exception handling is below

Figure 5 - Connection session managed by the digital control pilot

The *connection session* initiates when a connection is made between an *electric vehicle (EV)* and the *supply equipment (SE)*. The *SE* and *EV* attempt to select a common communications *Protocol Version*. If *LIN-CP* communications cannot be established, the *SE* may fall back to *PWM-CP* if supplied voltages are within allowable limits. See [6.2.3](#).

After *Protocol Version* selection completes successfully, during *LIN-CP Initialization* (see [9.6](#)), the *EV* signals its maximum nominal input voltage, frequency, and which contacts are present. If the *SE* can supply power at a voltage equal to or less than the *EV*'s maximum nominal voltage, then the available current (per phase, including *neutral*) and nominal operating voltages are signaled by the *SE*, and charging of the *EV* battery may commence.

Optionally, the *SE* may reconfigure and signal the supply configuration during *LIN-CP Initialization* based on *signals* first provided by the *EV* (see [9.6.2.1](#)), or when falling back to *PWM-CP* (e.g., under *PWM-CP*, the *SE* could be optimized for two-wire single-phase charging). The following are example use cases for this function:

- *SE* may be able to supply an alternative voltage and phase configuration. For example, a single-phase *EV* may connect to a three-phase 208Y/120 VAC *EVSE*; and without accommodation, the *EV* would receive only 120 VAC. Instead, the *SE* may dynamically reconfigure to optimize charging for 208 VAC single-phase charging.
- A three-wire split-phase 240/120 VAC *SE* may instead provide 240 VAC two-wire single-phase power to optimize charging. This reconfiguration ability is useful for *EVSE* used in Vehicle-to-Home or Vehicle-to-Load applications (refer to SAE J3068/2) where three-wire configurations eliminate the need for a neutral-forming transformer, but the ability to switch to two-wire to support single-phase-only charging is desired.
- If the *EVSE* is connected to multiple AC supplies (e.g. 208Y/120 and 480Y/277, or even an arbitrary AC voltage source), the *EV Initialization signals* can be used to determine what should be provided.

Once voltage ratings are negotiated and all other *Initialization* is successful, the *SE* signals that it is ready to start charging. The *EV* signals that it is able to charge by signaling via the *data link* and by closing *S₂* (which sets the positive amplitude of the *control pilot* to 6 V nominal). The *SE* closes the *contactor* only when all conditions are met. See [9.7.2](#).

Temperature monitoring in *couplers* is recommended for derating and required in some situations. See [5.5.2.10](#).

5. GENERAL REQUIREMENTS

5.1 Coupler Connection Types

SAE J3068 defines conductive electrical *couplers* capable of, but not limited to, three-phase AC charging. The *couplers* can be configured to use five, seven, or nine contacts. See [Tables 1](#) and [4](#).

5.1.1 Connection Types

Mechanically, SAE J3068 *couplers* comply with the requirements in [5.5](#).

SAE J3068 *couplers* and *socket-outlets* are classified as listed in [Table 1](#).

5.1.1.1 SAE J3068 *case C EVSE* and *case A EVs* shall use a *connector* type defined in [Table 1](#).

5.1.1.2 SAE J3068 *case B* and *case C EVs* shall use an *inlet* type defined in [Table 1](#).

5.1.1.3 SAE universal *EVSE* (*case A* and *case B*) shall use the *socket-outlet* type defined in [Table 1](#).

Table 1 - EVSE connection types

Coupler type	Contact positions used, see Table 4
SAE J3068 AC ₆	L1, L2, L3, N, <i>ground</i> , <i>CP</i> , <i>proximity</i>
SAE J3068 DC ₈ No AC	<i>Ground</i> , <i>CP</i> , <i>proximity</i> , DC+, DC-
SAE J3068 DC ₈ /AC ₆	L1, L2, L3, N, <i>ground</i> , <i>CP</i> , <i>proximity</i> , DC+, DC-
Socket-outlet type	
SAE universal AC ₆	L1, L2, L3, N, <i>ground</i> , <i>CP</i> , <i>proximity</i>

Note 1: The subscripts 6 and 8 denote the diameters in millimeters of the power pins used. See [Table 4](#).

Note 2: Type SAE J3068 DC₈/AC₆ is typically used for the *EV inlet*. *SE* supports either DC or AC, typically not both.

Note 3: Using 6-mm pins for DC is not supported in this edition of SAE J3068.

Note 4: For providing single-phase power transfer, N (*Neutral*) can be wired to a *line conductor*. See [5.3.1.5](#).

5.2 EVSE and EV Classification

SAE J3068 *EVSE* and *EV* are classified as listed in [Tables 2](#) and [3](#). The tables also list the maximum allowed power for each *SE* and *EV* type.

5.2.1 SE and EV Classification Tables

5.2.1.1 An SAE J3068 *SE* shall comply with applicable requirements listed in [Table 2](#).

5.2.1.2 An SAE J3068 *EV* shall comply with applicable requirements listed in [Table 3](#).

Table 2 - SE classification

Line	SE type	Power capability	
1	SAE J3068 AC ₆ <i>LIN</i>	≤600 VAC, nominal, <i>line-to-line</i> ≤160 A	
2	SAE J3068 AC ₆ <i>PWM</i> Not recommended for new designs	≤277 VAC nominal <i>single-phase 70 A</i> ≤480 VAC nominal <i>line-to-line 63 A</i>	
3	SAE J3068 AC ₆ <i>LIN/PWM</i>	As in line 1 when <i>LIN</i> is used As in line 2 when <i>PWM</i> is used	
4	SAE J3068 DC ₈ <i>PWM/PLC</i>	Refer to SAE J3400/SAE J1772	
5	SAE universal AC ₆ <i>LIN/PWM</i> (see Appendix B)	As in line 1 when <i>LIN</i> is used As in line 2 when <i>PWM</i> is used	

Table 3 - EV classification

Line	EV type	Power capability	
1	SAE J3068 AC ₆ <i>LIN</i>	≤600 VAC nominal <i>line-to-line</i> ≤160 A	
2	SAE J3068 AC ₆ <i>PWM</i> Not recommended for new designs	≤277 VAC nominal <i>line-to-neutral</i> ≤63/70 A	
3	SAE J3068 AC ₆ <i>LIN/PWM</i>	As in line 1 when <i>LIN</i> is used As in line 2 when <i>PWM</i> is used	
4	SAE J3068 DC ₈ No AC <i>PWM/PLC</i>	Refer to SAE J3400/SAE J1772	
5	SAE J3068 DC ₈ /AC ₆ <i>PWM/PLC</i>	As in line 2 when AC is used As in line 4 when DC is used	
6	SAE J3068 DC ₈ /AC ₆ <i>LIN/PWM/PLC</i>	As in line 1 when AC, <i>LIN</i> is used As in line 2 when AC, <i>PWM</i> is used As in line 4 when DC is used	

5.2.2 Supplied AC Voltage Compatibility

The *LIN-CP* communications specified in this document allow for an electrical compatibility check before the voltage is supplied by the *EVSE* (see [9.6.2.3](#) and [9.6.3.1](#)).

5.2.2.1 The *SE* shall communicate its nominal system voltage rounded as specified in ANSI C84.1 (see [8.3.27](#) and [8.3.28](#)).

5.2.2.2 The *EV* shall communicate its nominal voltage range by transmitting its minimum and maximum nominal voltage rounded as specified in ANSI C84.1. The *EV* may transmit a wider range, but whatever limits it transmits, it shall not be damaged by voltages 15% outside this transmitted range (see [8.3.7](#), [8.3.8](#), [8.3.10](#), and [8.3.11](#)).

5.2.2.3 If the vehicle transmits its limits according to ANSI C84.1 nominal system voltage, it shall operate normally to ANSI C84.1 utilization voltage range B or wider.

NOTE: The common Canadian four-wire three-phase 600 VAC configuration is omitted from ANSI C84.1 and should be represented as 600.0Y/347.0. Refer to IEC 60664-1, Annex B tables under “Nominal voltages presently used in the world” for other nominal voltages outside of North America.

EXAMPLE 1: A vehicle intended to operate with North American *EVSE* supplying either 208Y/120 or 480Y/277 should transmit limits of 208.0/120.0 to 480.0/277.0 using *LIN-CP*.

EXAMPLE 2: A vehicle intended to operate with 208Y/120 (U.S.), 240/120 (U.S.), or 400Y/230 (E.U.) should transmit limits of 208.0/120.0 to 400.0/240.0 using *LIN-CP*.

EXAMPLE 3: A vehicle intended to operate with 200/100 (Japan), 400Y/230 (E.U.), 415Y/240 (Middle East) should transmit limits of 200.0/100.0 to 415.0/240.0 using *LIN-CP*.

5.3 EVSE Requirements

5.3.1 EVSE General Requirements

5.3.1.1 The installation of the *EVSE* shall be done in accordance with *local electrical codes*.

5.3.1.2 The *EVSE* shall meet and be listed to the general product requirements specified in the *Tri-National AC EVSE Standard*.

5.3.1.3 The *EVSE* shall incorporate a personnel protection system as specified in the *Tri-National EVSE Safety Standards*.

The *EVSE* implements *proximity detection* as required in [Section 7](#).

5.3.1.4 An *SE* of type SAE J3068 AC₆ *LIN/PWM* (see [Table 1](#)) shall first attempt *LIN-CP* after plug-in. If *LIN* communication fails, then the *SE* may start *PWM-CP*. See [9.5.4](#).

Only symmetric three-phase supplies are supported in this edition of SAE J3068. Future editions of SAE J3068 may support asymmetric three-phase topologies (such as high-leg *delta* or corner-grounded *delta*), but this edition does not. See [8.3.27.3](#).

5.3.1.5 *Neutral* shall be provided with the following exceptions:

EXCEPTION 1: This requirement does not apply for application-specific *EVSE* installations designed to serve a limited set of vehicles which are not intended for use by the general public. Therefore, under this exception, contact number 4 is not wired to provide *neutral*. It is strongly recommended that new electrical installations include *neutral* to support single-phase charging or any *on-board charger* requiring *neutral*. This exception is intended to provide a way for *EVSE* to make use of existing 480 VAC three-wire *delta* power feeds for exclusive non-public applications.

EXCEPTION 2: *EVSE* when providing two-wire single-phase power transfer (e.g. 208 VAC, 240 VAC split-phase or single-phase) can wire contact 4 to a *line conductor* and would therefore not provide *neutral*. This reconfiguration could be dynamic; see [4.2](#), [9.6.2.1](#), and [B.1.4.1.7](#).

5.3.1.6 If present, *neutral* shall be wired through the *EVSE* to *connector* or *socket-outlet* contact number 4. See [Figure 7](#) and [Table 4](#).

5.3.1.7 At least contact number 1 shall be wired to a *line conductor*. See [Figure 7](#) and [Table 4](#).

5.3.1.8 *EVSE* providing three-phase power transfer shall be wired in time sequence for clockwise rotation and the *EVSE* is permitted to check for proper phasing as part of its startup self-check.

NOTE: For installations with multiple *EVSE*, which allow single-phase charging from three-phase supplies, the mapping of premises wiring should be varied to limit phase imbalance while maintaining clockwise rotation.

EXAMPLE: In an installation with several *EVSE* with phase contact numbers 1, 2, and 3, and premises phases A, B, and C, the first *EVSE* would be wired as 1-A, 2-B, 3-C; the second *EVSE* as 1-B, 2-C, 3-A; and the third *EVSE* as 1-C, 2-A, 3-B, etc.

5.3.2 Operation Limits Defined in IEC 61851/IEC 62196 versus SAE J3068

SAE J3068 is designed to interoperate with type 2 *coupler* systems defined in IEC 61851-1 and IEC 62196-2 which indicate support for system voltages up to 480 VAC and currents up to 63 A three-phase or 70 A single-phase. To support systems beyond the aforementioned voltage and/or current limits, certain constraints are imposed on *EVSE*.

- 5.3.2.1 *EVSE* designed to provide more than 63 A three-phase and/or more than 70 A single-phase shall be *case C* and be tested and listed as a complete assembly to the *Tri-National AC EVSE Standard*.

NOTE: Future versions of this document may fully define *cable assembly* nodes (outlined in [6.2.4](#)), which can provide arbitrary voltage and current coding for *case B*.

- 5.3.2.2 *EVSE* shall not use *PWM-CP* controls when nominal system voltages exceed 480Y/277 VAC (single-phase 277 VAC). *LIN-CP* shall be used when these voltage limits are exceeded (e.g. 600Y/347 VAC).

NOTE 1: IEC 62196-2 states compatibility with 480 VAC three-phase, but this is in conjunction with a single-phase voltage rating of 250 VAC. As this is mathematically incongruent (480 divided by the square root of 3 is 277, but 250 multiplied by the square root of 3 is approximately 433), the higher rating is taken for North American application.

NOTE 2: *EVSE* which are designed for use outside of North America may round-down the incongruent three-phase and single-phase ratings in the IEC, and may limit *PWM-CP* to systems not exceeding a 440Y/250 VAC rating.

NOTE 3: Under IEC 60664-1, three-phase supplies at 480Y/277, 230Y/400, 240 high-leg *delta* correspond to the same impulse over-voltage requirements and other requirements for insulation, creepage, and clearance because they all exceed 150 VAC phase-to-ground but are less than 300 VAC phase-to-ground.

PWM-CP (only) *SE* are not recommended for new designs.

5.4 EV Requirements

These requirements apply to vehicles with SAE J3068 *inlets*.

5.4.1 EV Cable Ampacity Coordination

Vehicle cabling and wiring should be protected against overcurrent and limit their short-circuit rating. Example protection methods include proper wire sizing and/or provision of circuit protection, such as fuses. The maximum rating for the three-phase AC energy transfer (with advanced contacts) is 160 A using a 200 A circuit breaker. The design of the *electric vehicle* wiring from the *connector* to the *charger* needs to consider the full range of *EVSE* output.

5.4.2 EV General Requirements

- 5.4.2.1 The *on-board EV* charging system electronic components shall meet the requirements specified in SAE J1211.

- 5.4.2.2 If the *EV* is designed to draw current only from a single-phase, it shall be capable of drawing current between SAE J3068 AC₆ contact numbers 1 and 4 (see [Figure 7](#) and [Table 4](#)).

The *EV* implements the *proximity detection* as required in [Section 7](#).

- 5.4.2.3 The *EV* shall not support *PWM-CP* unless it is designed to indefinitely withstand 277 VAC nominal if single-phase and 480Y/277 VAC if three-phase.

5.4.3 Inlet Locking

To protect personnel safety and to prevent premature wear of electrical contacts in the *coupler*, the *inlet* is *locked* whenever voltage is supplied. See [9.7.2.1](#) and [10.8.5.1](#).

The *locking mechanism* includes the ability to electronically monitor the state of the *mechanism*. See [5.5.2.8](#). An electronically controlled *locking mechanism* is typical, but a manually actuated *mechanism* may be preferred in some applications.

There are many factors to consider when choosing a *locking* scheme. These include: the probability of *locking* success, sharing *EVSE* between vehicles, the use of energy management systems, user convenience, implementation complexity, and the connection case (i.e., *case B* or *case C*). As many of these factors are not under the control of the *EV* manufacturer, operator configurability may be appropriate.

Locking success is most probable when the *locking mechanism* is mounted in one of the side positions (note the left-mounted servo motor in the top right photo in [Figure 7](#)) and *locking* occurs while the operator is holding the *connector*. Otherwise, the weight of the cable or other external factors can cause the locking pin to be misaligned with the hole (especially when the servo is mounted in the top position). Therefore, *locking* quickly upon insertion is recommended as SAE J3068 is designed to allow charging to commence as quickly as possible. *Locking* upon successful completion of *Initialization* (typically around 250 ms; see [9.6.2](#)) ensures *locking* will occur while the *connector* is being held without having to *unlock* if the vehicle and *EVSE* are incompatible.

In a situation where *EVSE* are shared, and the *EVSE* are configured for *case C*, it is preferable for *inlets* to be *unlocked* when charging is complete so a *connector* may be moved from the *inlet* of a full vehicle to another vehicle without the operator of the full vehicle being present. However, *unlocking* when not charging may be problematic when energy management systems are in use as *re-locking* may fail when power again becomes available. In situations where *case B* charging is a possibility, an *EV's inlet locking mechanism* is controlled by the operator to prevent theft of the *EV cable assembly*.

Use of an auxiliary *locking mechanism* in one of the other mounting positions responsible for ensuring success of the primary *mechanism* and tamper prevention simplifies these considerations significantly. A manually actuated *locking mechanism* confers similar advantages.

5.5 Couplers, Socket-Outlets, and Plugs

5.5.1 General Requirements

5.5.1.1 *Couplers* (which encompass *connectors* and *inlets*), *socket-outlets*, and *plugs* shall fulfill the requirements defined in the *Tri-National Coupler Standard*.

5.5.1.2 Equipment and components utilizing *sockets-outlets* and/or *plugs* shall meet the applicable requirements in [Appendix B](#).

Couplers, *socket-outlets*, and *plugs* manufactured according to this recommended practice may be marked on its outer surface in Arial font: "SAE J3068." Any party providing such identification warrants that the *socket-outlets*, *plugs*, *connector*, and/or vehicle *inlet* complies with all mandatory requirements of this recommended practice and agrees to indemnify and hold SAE harmless from any and all liability arising out of any failure to comply and any resulting injury or damage arising from such failure.

5.5.2 Coupler Requirements

- 5.5.2.1 SAE J3068 AC₆ *connectors* shall have a mechanical design according to IEC 62196-2:2022, Sheet 2-IIe, Sheet 1 and Sheet 2.
- 5.5.2.2 SAE J3068 AC₆ *inlets* shall have a mechanical design according to IEC 62196-2:2022, Sheet 2-IIf, Sheet 1 and Sheet 2.
- 5.5.2.3 SAE J3068 DC₈ No AC and SAE J3068 DC₈/AC₆ *couplers* shall have a mechanical design according to IEC 62196-3:2014 Standard Sheets 3-IVa Sheet 1 through Sheet 5, and Standard Sheets 3-IVc Sheet 1 through Sheet 5.
- 5.5.2.4 All SAE J3068 *couplers* shall comply with requirements 26.7 (insulating end caps pull test) from IEC 62196-1:2020.
- 5.5.2.5 *Couplers* shall have contact functionality according to IEC 62196-2 and IEC 62196-3; see [Table 4](#) for a summary.
- 5.5.2.6 SAE J3068 AC₆ *inlets* shall provide packaging room for the *connector* according to IEC 62196-2:2022, Sheet 2-IIh.
- 5.5.2.7 SAE J3068 DC₈/AC₆ or SAE J3068 DC₈ No AC *inlets* shall provide packaging room according to IEC 62196-3:2014 Standard Sheets 3-IVd Sheet 1.

IEC 62196-2 specifies maximum rated current at 63 A three-phase and 70 A single-phase for type 2 (mechanically equivalent to SAE J3068 AC₆) *couplers*. SAE J3068 AC₆ supports higher AC rated current, and higher AC voltages. See [5.3.2](#).

Couplers may be commonly rated with a *line-to-line* nominal voltage of 480 VAC, 600 VAC, or 1000 VDC in North America.

- 5.5.2.8 *Inlets* shall be equipped with a *locking mechanism* that includes a monitoring function indicating whether it is *locked* or *unlocked*.
- 5.5.2.9 SAE J3068 *connectors* shall apply current coding via the *proximity* circuit, as defined in [7.2](#). *Connectors* rated >63 A three-phase or >70 A single-phase shall signal current limit via the digital *data link* and the *proximity* resistor shall be coded for 63 A three-phase (70 A single-phase). See [5.3.2.1](#).
- 5.5.2.10 Temperature monitoring shall be used in *inlets* at current levels >63 A for three-phase or >70 A for single-phase.

Temperature monitoring for *inlets* is recommended at current levels >32 A and allowed at any current level.

Temperature monitoring is recommended for *case C connectors* (or *case A plugs*) at current levels >32 A and allowed at any current level.

NOTE: Thermal cutouts could fulfill temperature monitoring requirements; however, this limits derating and may increase operational risk while charging.

[Figures 7](#) and [8](#) show the contact placement for different *connector* and *inlet* types.

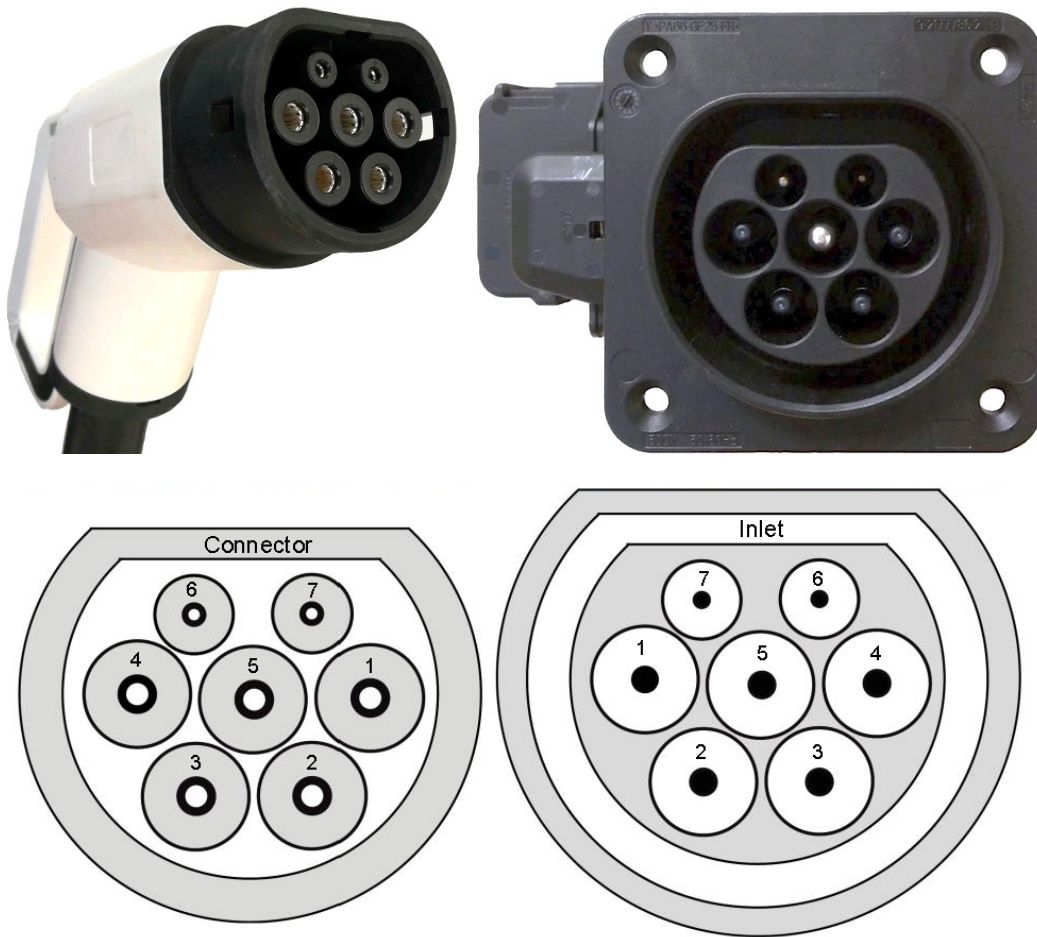


Figure 7 - Typical SAE J3068 AC₆ connector and inlet photos (contact placement as seen by user)

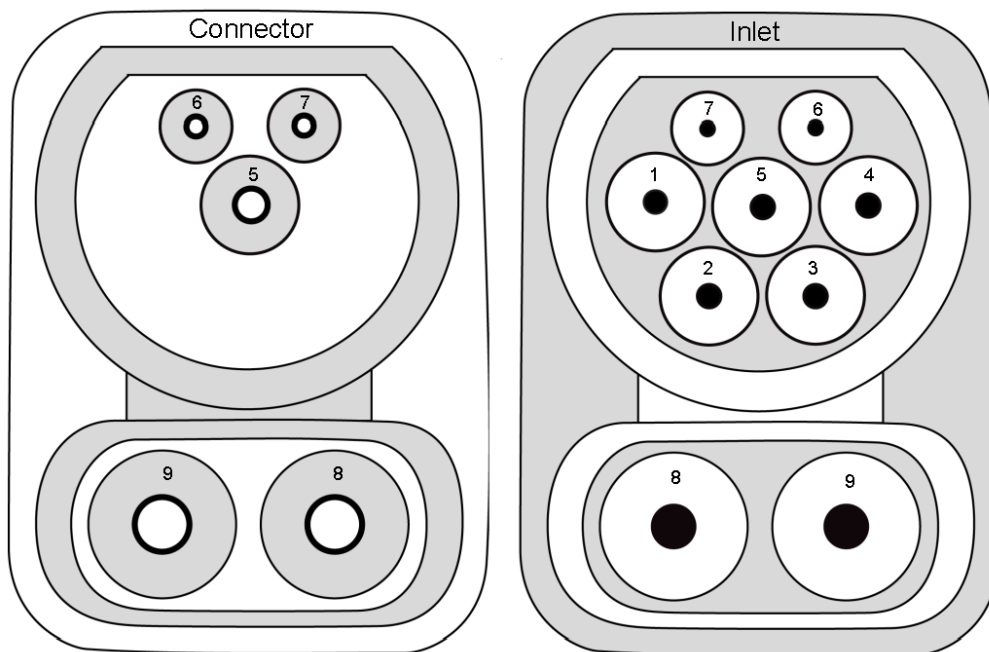


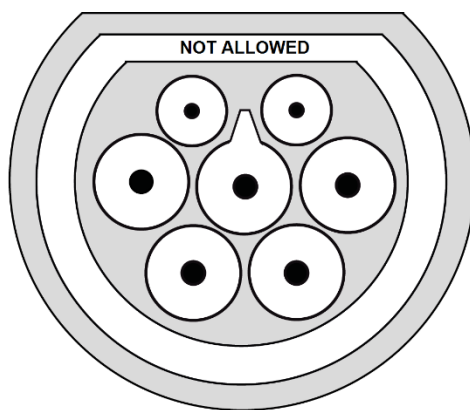
Figure 8 - SAE J3068 DC₈ no AC connector and SAE J3068 DC₈/AC₆ inlet (contact placement as seen by user)

Table 4 - Coupler contact functions

Contact Number	Contact Pin Diameter (millimeters)	Nominal Contact Function	Description
1	6	L1 AC	Power phase <i>line 1</i> (see 5.3.1.7)
2	6	L2 AC	Power phase <i>line 2</i>
3	6	L3 AC	Power phase <i>line 3</i>
4	6	<i>Neutral</i>	<i>Neutral</i> (may be a <i>line conductor</i> for single-phase charging; see 5.3.1.5)
5	6	<i>Equipment Ground</i>	Connects <i>SE equipment grounding conductor</i> to <i>EV chassis ground</i> during charging
6	3	<i>Control Pilot</i>	Primary control <i>conductor</i> (function described in Section 6)
7	3	<i>Proximity Pin</i>	Allows <i>EV</i> to detect presence of <i>connector</i> (function described in Section 7)
8	8	DC negative	DC power transfer (see 5.6.2)
9	8	DC positive	DC power transfer (see 5.6.2)

5.5.2.11 The *couplers* described in IEC 62196-2:2022, Sheets 2-Ilc and 2-Ild (illustrated in [Figure 9](#)) shall not be used in North America.

These *couplers* are also forbidden in many other regions. They are used in regions that allow charging without an *EVSE*. Refer to the “EV charging modes” section of IEC 61851-1.

**Figure 9 - AC₆ keyed couplers, NOT ALLOWED**

5.6 Communication Requirements

5.6.1 LIN-CP Communication

LIN-CP communication is used between the *SE* and the *EV* if nominal system voltage is greater than 480Y/277 VAC. See [5.3.2.2](#).

LIN-CP is recommended for new designs; *PWM-CP* (only) is not recommended for new designs.

LIN-CP communication is used to verify the power compatibility between the *SE* and the *EV* before the *SE* supplies voltage to the *EV*. See [9.6.2.3](#) and [9.6.3.1](#).

SE uses *LIN-CP signals* to indicate to the *EV* that it is able or not able to supply voltage. See [9.7.2](#).

SE uses *LIN-CP signals* to indicate to the EV the maximum available current. See [9.7.3.1](#).

The EV draws no more than the indicated maximum available current. See [9.7.3.3](#).

If *LIN-CP signals* are interrupted, the SE stops supplying voltage. See [10.7.1.1](#).

See [6.2](#) and [Sections 8, 9, and 10](#) for implementation requirements.

SE determines whether the *connector* is inserted into the EV *inlet* and properly connected to the EV. See [9.4.1.1](#).

The SE *equipment ground's* connection to the EV *chassis ground* is monitored during charging. If a disconnection is detected, the SE stops supplying voltage. See [10.8.4.1](#).

SE detects disconnection from the EV. If a disconnection is detected, the SE stops supplying voltage. See [10.8.4.1](#).

The EV indicates to the SE if it allows the SE to supply voltage or if it requests the SE to stop supplying voltage. See [9.7.2](#).

See [6.2](#) and [9.7.2](#) for implementation requirements. See [8.3.16.1](#) and [Figure 15](#).

5.6.2 DC Charging

5.6.2.1 For control of DC charging with the SAE J3068 DC₈ *coupler*, the system shall meet the requirements of SAE J3400 for DC power transfer except:

- Identify as an SAE J3068 DC₈ (CCS2) system via digital communication
- Implement EV *proximity detection* as required by [Section 7](#), which harmonizes with SAE J3400, including required EVSE *proximity* monitoring and thermal warning/shutdown

Vehicles with SAE J3068 *inlets* use +5 VDC for the *proximity* supply, and require the *inlet* be fitted with a 2.7k Ω R₅ resistor. Additionally, as required by [7.2.1.6](#), SAE J3068 DC₈ EVs allow DC power transfer using both the IEC 62196-3 type 2 DC *proximity* coding resistor (1500 Ω) and the SAE J3400 DC *proximity* coding resistor (150 Ω). This permits interoperability with stations which are required to monitor *proximity*, including SAE J3400 and SAE J1772.

Accessories that adapt SAE J3068 DC₈ *connectors* (CCS2) to SAE J1772 or SAE J3400 *inlets* include a parallel *proximity* resistor R_D (refer to the SAE J3400 series) to adapt 1500 Ω to the typical SAE J3400 R₆ of 150 Ω (R_D = 166.6 Ω or similar).

An EV that can charge using both DC and AC may also implement *LIN-CP*.

5.6.3 Proximity Function

The *coupler* system provides a means to detect the presence of the *connector* in the EV *inlet*. Detection of the *connector* occurs at a depth of insertion at which damage to the *coupler*, EV, or EVSE is possible if the EV were to be intentionally moved. See [5.5.2.1](#) and [5.5.2.2](#). The EV is immobilized even if that *connector* is not connected to the service equipment. The EV detects this connection via the *proximity* pin resistor in the *connector*. See [9.4.1.1](#).

The *connector* and *plug* system also provide *proximity* coding using resistors to help determine the ampacity of the cable attached. See *proximity detection* ([Section 7](#)) for implementation requirements for SAE J3068 *couplers*, and [Appendix B](#) for *socket-outlet* and *plug proximity detection* requirements.

6. CONTROL PILOT

6.1 General

The *control pilot* circuit is the primary control means to ensure proper functioning when connecting an *EV* to the *SE*. This section describes the *control pilot* circuit hardware and how it is used to enable signaling between the *EV* and the *SE*. It also describes the transceivers used for *LIN* communication.

The *control pilot* circuit in SAE J3068 is related to the *control pilot* circuit defined in the “Control Pilot” section of SAE J1772. This may facilitate designing an *SE* or an *EV* that is interoperable with both *LIN-CP* and *PWM-CP*.

The added transceivers enable bidirectional baseband *LIN* communication with a bit rate of 19.2 *kbps*. At this bit rate, 1-bit duration is approximately 50 μ s, which is the same as the pulse width for a 5% *PWM*.

LIN transceivers as defined in ISO 17987-4 are well-suited for this application because they are designed for communication over a single wire and *ground*, and for a bus topology with a 1 k Ω resistor as a pull-up resistor to +12 V. Most *LIN* transceivers contain an internal 30 k Ω pull-up resistor that can interfere with detection of SAE J1772 State F. See [6.2.3](#).

The transceiver contains a transmitter that sends logic zero bits by closing a switch to *ground* to create a *control pilot* voltage close to *ground* level. This level is called the dominant level.

When the transmitter switch is not closed, the transmitter is passive and the *control pilot* voltage is positive, as a function of the remainder of *control pilot* circuit. This positive level represents logic-one bits and is called the recessive level.

The transceiver also contains a receiver that detects if received bits are logic-one or logic-zero.

A *data link* node typically consists of the *LIN* transceiver chip connected to a serial port (*UART*) of an *MCU*. The *MCU* has software that handles the *LIN* protocol and the *application program*.

[Figure 10](#) shows a comparison between the *signals* sent on the *control pilot* when using *PWM-CP* as in SAE J1772, and *LIN-CP* as in SAE J3068.

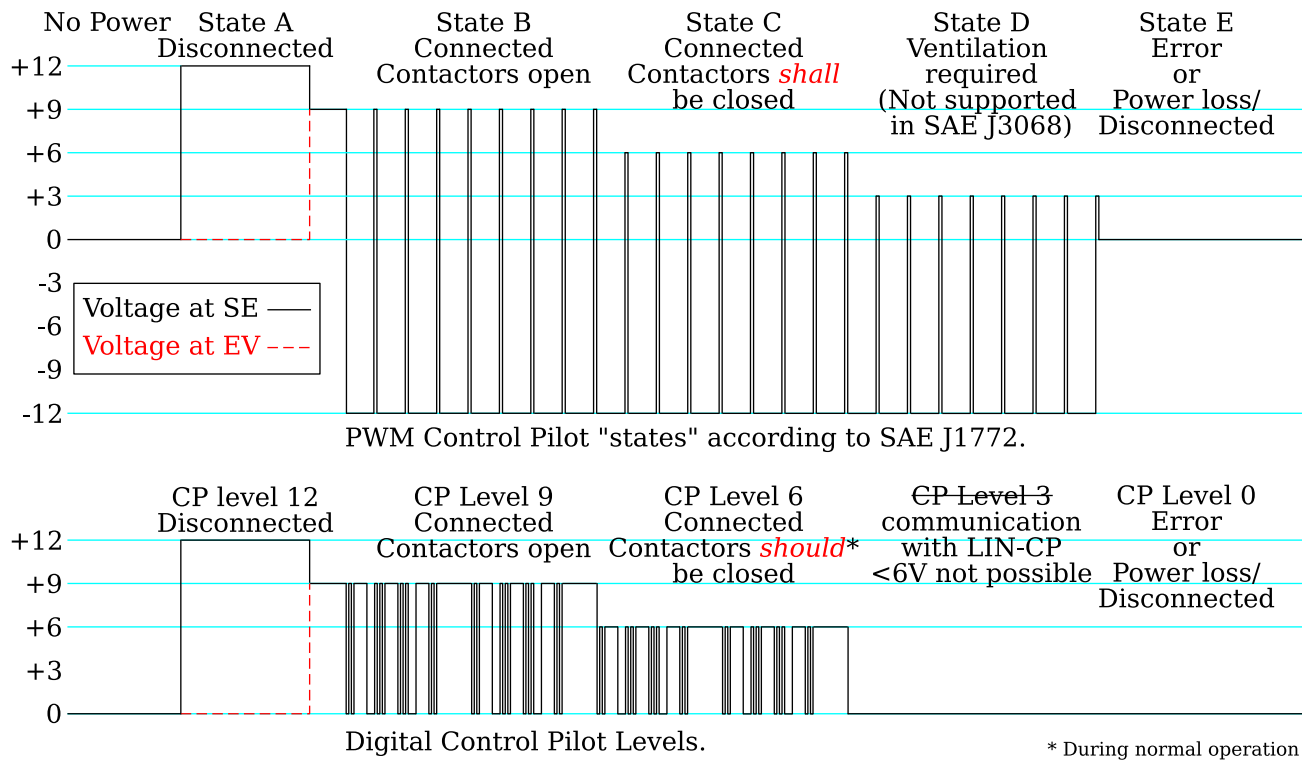


Figure 10 - Comparison of SAE J3068 CP levels to SAE J1772 states (not to scale)