



Fisuel Seminar – 07-08 of October 2026

Rome - Italy

EVCI: Electrical Vehicle Charging Infrastructure

Content

- Responsibilities (installation & inspection)
- Risk of long charging vehicles for simple domestic outlet which are not designed for this application
- V2G installation, the impact of injection of the current from car to utility, fire caused by EVCI

Country	Charging Category	Installation Responsibility	Required Inspections
Germany	Home (Residential) AC Wallbox	Qualified and certified electrician (<i>Elektrofachkraft</i>) under VDE standards; mandatory DSO pre-registration for wallboxes above 11 kW	Initial testing/measurement protocol and commissioning report (<i>Zunahmeanzeige</i>)
	Public AC Charging	Certified electrical contractors and CPOs adhering to commercial grid connection rules (TAB)	Initial technical acceptance and periodic safety tests under DGUV V3
	Public DC Fast Charging	Specialized high-voltage contractors coordinating with regional DSOs	Initial commissioning tests, grid operator acceptance, and statutory DGUV V3 tests
France	Home (Residential) AC Wallbox	Electricians holding specialized EV-infrastructure qualifications (<i>Qualification IRVE</i>)	Installer compliance verification; formal <i>Consuel</i> inspection certificate required only for new dedicated supply lines/meters
	Public AC Charging	CPOs and IRVE-qualified contractors following NF C 15-100 standards	Mandatory pre-commissioning verification and safety inspection reports for public ERP facilities
	Public DC Fast Charging	Specialized industrial electrical firms partnering with DSOs (e.g., Enedis)	Mandatory compliance audits, periodic maintenance, and adherence to <i>Guide PS</i> fire safety codes
Italy	Home (Residential) AC Wallbox	Licensed installation companies (<i>imprese installatrici abilitate</i>) under DM 37/08 and CEI 64-8	Issuance of a formal Declaration of Conformity (Di.Co.) verifying protection devices and grounding
	Public AC Charging	Authorized electrical engineering contractors complying with CEI 0-21 and CEI 64-8	Initial technician testing, certification, and periodic safety checks
	Public DC Fast Charging	Specialized high-power infrastructure developers coordinating with local DSOs (e.g., e-distribuzione)	Comprehensive commissioning test reports and electrical safety certification
United Kingdom	Home (Residential) AC Wallbox	Certified competent electricians in compliance with BS 7671 and Building Regulations (Part P)	Issuance of an Electrical Installation Certificate (EIC) detailing test results for impedance, polarity, and RCDs
	Public AC Charging	Approved electrical contractors working for CPOs under BS 7671 and IET code of practice	Initial verification prior to live launch and routine periodic inspection and testing (PIT)
	Public DC Fast Charging	Specialist high-voltage engineering firms collaborating with Distribution Network Operators (DNOs)	Pre-commissioning testing, DNO witness testing, and commercial periodic maintenance inspections

Country	Charging Category	Installation Responsibility	Required Inspections
Turkiye	Home (Residential) AC Wallbox	Installed by qualified electricians or electrical contractors in compliance with national interior electrical installation standards. Requires a technical review and prior application/approval from the local electricity distribution company (e.g., BEDAŞ, Başkent EDAŞ, etc.) to evaluate existing meter and line capacity.	Initial testing by the installer (insulation, grounding resistance, 30 mA residual current protection checks). No EPDK license is required for private domestic use tied to an existing household subscription.
	Public AC Charging	Must be executed under the authority of a holder of an EPDK Charging Network Operator License or via certified third-party operators authorized under a network certificate. Physical wiring must adhere to Turkish Electrical Installation Regulations and use standard Type-2 sockets (TS EN 62196-2).	Mandatory compliance audits by the network operator. Station must obtain a formal Business Opening and Operating License from local municipalities. Registration on EPDK's open-access platform for real-time station tracking.
	Public DC Fast Charging	•Executed exclusively by or under the direct authority of EPDK-licensed Charging Network Operators. Requires heavy electrical engineering works, medium-voltage (MV) grid connection agreements, and coordination with regional distribution companies for transformer setups. Mandates Combo-2 (TS EN 62196-3) socket standards, with highway units required to feature at least 50% DC fast chargers (50 kW+).	Rigorous grid-integration commissioning tests and technical acceptance by the local grid operator. Statutory compliance inspections under EPDK market surveillance, fire safety regulations (especially for covered or underground parking installations), and municipal operating licensing.

Inspections (Singapore example)

Purpose	Frequency	Location Installed	Type of EV Charger	Form
Installation of New EV Charger		Restricted Access Location	Fixed EV Charger less than 200kW without thermal management system	1
Relocation of EV Charger		Non-Restricted Access Location	Fixed EV Charger more than 150kW with thermal management system	2
			Non-Fixed EV Charger	3
Periodic Inspection	Every 24 months	Restricted Access Location	Fixed EV Charger less than 200kW without thermal management system	A
			Fixed EV Charger more than 150kW with thermal management system	C
			Non-Fixed EV Charger	B
Periodic Inspection	Every 6 months	Non-Restricted Access Location	Fixed EV Charger less than 200kW without thermal management system	A
			Fixed EV Charger more than 150kW with thermal management system	C
			Non-Fixed EV Charger	B
Periodic Inspection	Every 12 months	Non-Restricted Access Location	Fixed EV Charger less than 200kW without thermal management system	D
			Fixed EV Charger more than 150kW with thermal management system	E
Modified EV Charger that are registered		Restricted Access Location	Fixed EV Charger less than 200kW without thermal management system	1A
		Non-Restricted Access Location	Fixed EV Charger more than 150kW with thermal management system	2A
			Non-Fixed EV Charger	3A

A comprehensive EV charging system inspection comprises the following components:

Electrical components: This includes cables connectors circuit breakers transformers and other electrical infrastructure checking for signs of wear damage or overheating.

Grounding and bonding: Verifying proper grounding and bonding connections are secure and meet safety regulations.

Communication systems: Ensuring communication protocols between the charger and user interface or management systems function correctly.

Physical integrity: Inspect for any physical damage to the charging station housing cables and other hardware components.

Software and firmware: Verifying the software and firmware are up-to-date and functioning as intended.

Under TR 25:2022 for Periodic Inspection a series of detailed tests are conducted to ensure the EV charger's utmost safety and reliability.

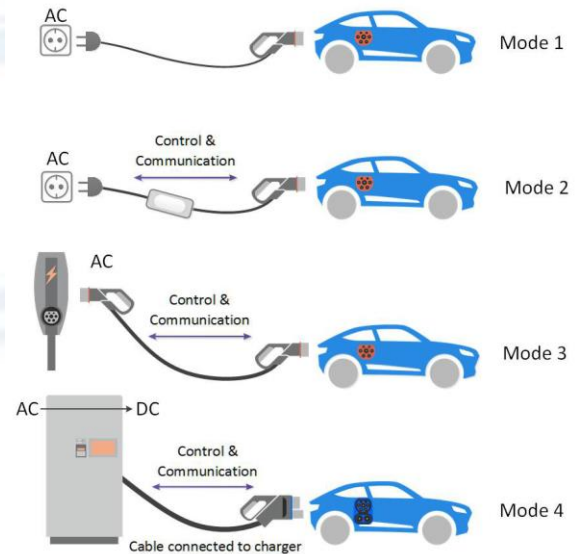
1. Document Reviews (Type Approval Operational Manual)
2. External Environmental Inspection
3. Resistance measurement for pilot control
4. Functionality Test
5. Under Normal Conditions Start Stop Charging Sequence Test
6. Abnormal Shock Circuit Simulation Test
7. Tripping Test for RCCD
8. Earth Loop Impedance Test
9. Insulation Resistance Test

V2G (vehicle to grid) applications

Country	Regulatory Status & Governing Bodies	Technical & Interoperability Standards
Germany	- Actively reforming framework via the Federal Ministry for Economic Affairs and Energy (BMWK). - Signatory of the <i>European Coalition of the Willing for Bidirectional Charging</i>.	- VDE application rules under development. - Relies on ISO 15118-20 for secure vehicle-to-charger communication.
France	- Governed by energy code provisions overseen by CRE (Regulatory Commission of Energy) and transmission system operator RTE. - Commercial V2G permitted without sandboxes, but heavily tied to smart-metering infrastructure (Linky).	Compliance with French electrical code NF C 15-100 and Enedis grid connection guidelines for injection units.
Italy	- Regulated by ARERA (Regulatory Authority for Energy, Networks and Environment) alongside Terna's strategic pilot frameworks. - Advanced regulatory provisions allowing domestic and commercial V2G integration.	Strict adherence to CEI 0-21 (for low-voltage grid integration) and CEI 64-8 installation rules.
United Kingdom	Spearheaded by Ofgem and NESO (National Energy System Operator) through smart systems and flexibility plan policies.	Engineering Recommendation G98/G99 for grid connection; rigorous compliance with IET Code of Practice.
Türkiye	- Regulated under the Energy Market Regulatory Authority (EPDK) Charging Service Regulations. - V2G framework is currently in an exploratory and pilot phase, with primary focus scaling standard unidirectional infrastructure first.	Standard national electrical wiring codes apply; evolving alignment with international IEC 61851-1 and ISO 15118 protocols for future integration.

Recharging mode	Description	Protection level
Mode 1	Connection of an EV to a standard socket-outlet of an alternating current (AC) supply network by utilising a cable and plug. Both of which are not fitted with any supplementary pilot or auxiliary contacts. <i>Note: Not allowed in the United States of America, Israel, and the UK; prohibited for public recharging in Italy; restricted in Switzerland, Denmark, Norway, and Germany.</i>	- Non-dedicated power sockets - Simple cable - Risk of overheating - No other residual current device than that installed at the origin of the installation, if any.
Mode 2	Connection of a BEV to a standard socket-outlet or a reinforced socket-outlet of an AC supply network utilising an AC BEV supply equipment with a cable and plug, with a control pilot function and system for personal protection against electric shock placed between the standard plug and the EV. Typical portable / "emergency" charger. <i>Note: Prohibited for public recharging in Italy; restricted in the United States of America, Canada, Switzerland, Denmark, France, and Norway.</i>	- It should be set up with a new dedicated circuit and a dedicated socket-outlets. - Dedicated cable (IC-CPD) should include control and safety functions. - Setting of the IC-CPD current depends on the national regulation. - IC-CPD includes residual current device, control of earthing continuity.
Mode 3	Connection of a BEV to an AC BEV supply equipment permanently connected to an AC supply network, with a control pilot function that extends from the AC BEV supply equipment to the BEV. <i>Note: It includes bidirectional communication. Tethered (cable permanently attached) and untethered (dedicated socket outlet only) configurations are available. This is a typical public AC charger installation mode.</i>	- Dedicated recharging infrastructure incorporating charge and battery temperature monitoring; - Possible communication with parking lot supervision system and fire alarm system; - Dedicated cable.
Mode 4	Connection of a BEV to an AC or direct current (DC) supply network utilising a DC BEV supply equipment, with a control pilot function that extends from the DC BEV supply equipment to the BEV. <i>Note: This is a typical installation for "fast charging", "ultrafast charging", "rapid charging" and similar terms.</i>	- Dedicated power socket incorporating charge monitoring; - Dedicated cable; - Residual current device included.

Charging modes



Guidance of fire safety for electric vehicles parked and charging infrastructure in covered parking spaces

553.2.6.1 Choix du type de DDR

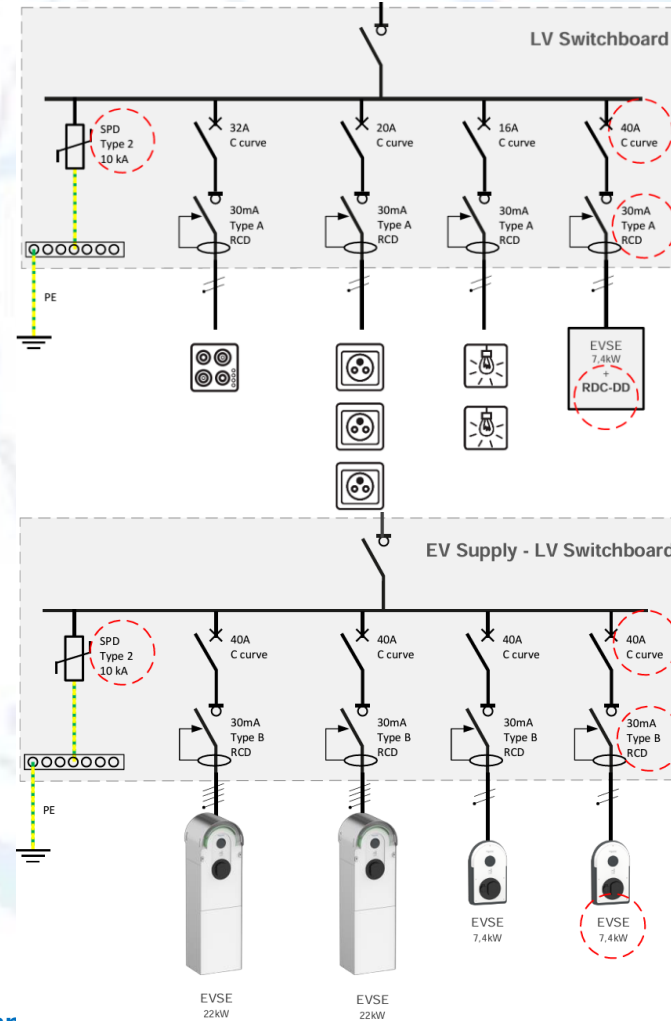
En amont du variateur, le choix du DDR doit être fait conformément au tableau 55.1.

Le tableau 55.1 permet d'affiner le choix du DDR en fonction de certaines caractéristiques du matériel ou de l'installation.

Tableau 55.1A – Choix du type de DDR

	Protection contre les contacts indirects			Protection complémentaire contre les contacts directs		
Alimentation du variateur	Triphasée		Monophasée	Triphasée		Monophasée
Caractéristiques du matériel et de l'installation	Sans double isolement sur l'étage à courant continu	Avec double isolement sur l'étage à courant continu	Avec ou sans double isolement sur l'étage à courant continu	Sans double isolement sur l'étage à courant continu	Avec double isolement sur l'étage à courant continu	Avec ou sans double isolement sur l'étage à courant continu
TT (ou IT avec des masses non interconnectées)	Type B (≥ 300 mA)	Type F [**] (≥ 300 mA)		Type B (30 mA)	Type F [**] (30 mA)	
TN-S	Type F [**] (≥ 300 mA) [**]					
IT						
[*] Le défaut d'isolement s'apparente à un court-circuit. Le déclenchement doit normalement être assuré par la protection contre les courts-circuits, mais l'utilisation d'un DDR est recommandée en cas de risque de non déclenchement des protections à maximum de courant.						
[**] Toutefois, le Type A est admis pour les installations existantes.						

RCDs used in EVCI



RCDs used in EVCI

722.531 Devices for protection against indirect contact by automatic disconnection of supply

722.531.2 Residual current protective devices

Add the following:

– 12 – IEC 60364-7-722:2018 © IEC 2018

722.531.2.101

RCDs protecting each connecting point in accordance with 722.411.3.3 shall comply at least with the requirements of an RCD type A and shall have a rated residual operating current not exceeding 30 mA.

Where the EV charging station is equipped with a socket-outlet or vehicle connector complying with IEC 62196 (all parts), protective measures against DC fault current shall be taken, except where provided by the EV charging station. The appropriate measures, for each connection point, shall be as follows:

- the use of an RCD type B; or
- the use of an RCD type A in conjunction with a residual direct current detecting device (RDC-DD) complying with IEC 62955; or
- the use of an RCD type F in conjunction with a residual direct current detecting device (RDC-DD) complying with IEC 62955.

RCDs shall comply with one of the following standards: IEC 61008-1, IEC 61009-1, IEC 60947-2 or IEC 62423.

NOTE Subclause 722.531.2.101 is not applicable in case the connecting point is protected by other protective measures against electric shock such as SELV or electric separation.

**Residual
Direct
Current
Detecting
Device**

- <https://op.europa.eu/en/publication-detail/-/publication/c2c1f892-f3ef-11ef-b7db-01aa75ed71a1/language-en>
- <https://www.evfiresafe.com/>
- <https://commercial.allianz.com/news-and-insights/expert-risk-articles/risks-of-the-ev-evolution.html>

EVCI

- ACEA Electric Vehicles Report & European Alternative Fuels Observatory (EAFO)
eafo.eu - acea.auto
- Türkiye EV Charging Services Regulation & EPDK Licensing Updates (epdk.gov.tr)
- Domestic Socket Thermal Overload & IEC 61851 Safety Guidelines (iec.ch)
- V2G Grid Injection, Anti-Islanding (IEEE 1547) & ISO 15118-20 Protocols (standards.ieee.org)

Closing Seminar

**MERCI - THANKS - GRACIAS
- GRAZIE- TEŞEKKÜRLER**

