Charge controller

SECC 01

CHARGE CONTROLLER FOR DEPLOYMENT
IN AC CHARGING STATIONS
COMPLIANT WITH EN 61851-1
FOR USE IN CHARGING MODE 3

PRODUCT INFORMATION

Product description

The SECC 01 charge controller is suitable for deployment in AC charging stations for electric vehicles according to EN 61851-1 charging mode 3. It includes all functions necessary for communications with the electric vehicle, control of the charging process, and a user interface.

As a special feature, various charging modes are integrated to support the use of specific electricity rates for electromobility and enable grid-beneficial charging. Charging can also be adapted to the availability of renewable energy, thereby optimizing the CO_2 balance of the connected electric vehicle.

The LAN and wireless communications interfaces of the charge controller enable various use scenarios for networking as well as convenient operation.

An RFID reader can be connected to enable use of the charging station. This is especially advantageous in commercial deployment.

The S0 signal of an electricity meter can be evaluated to register energy consumption during charging. Measured values can also be accepted via an RS485 interface.

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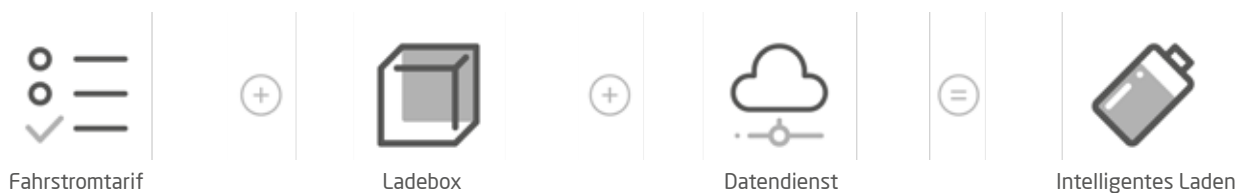
Functional features

- Controlling the charging process of electric vehicles in accordance with EN 61851-1 charging mode 3

- Integrated AC power supply

- Top-hat rail mounting

- Three-button operation and LED status indication

- Port for RFID reader connection

- Outlet unlocking drive in combination with an unlocking module

- LAN port

- Web interface for configuration

- OCPP V1.6 J

- Wireless communications interface for portable communications devices

- Various charging modes to accommodate rate and load levels

- Local offline charge load management

Deployment areas

- AC charging stations according to EN 61851-1 charging mode 3

- Charging equipment for private and semi-public electric vehicles

- Controlled charging of electric vehicles in accordance with Section 14a EnWG

Technical features

| Feature	Designation	Specification
Electrical connection	Rated voltage	230 V ±10 %; max. 2.5 mm²
	AC line frequency	50 Hz
	SECC max. current consumption	1.0 A
	Average current consumption	0.02 A
	Max. total current consumption (including switching relay)	3.0 A
	SECC average power consumption (without external loads)	approx. 5 VA
Protection class		II (symbol ▢)
Protection rating		IP20
Overvoltage category		CAT 3
Operating mode		Charge controller for electric vehicles according to EN 61851-1 for charge modes 2 and 3
Ambient conditions		
	Operating temperature	-25 °C to +55 °C
	Permissible relative humidity	30 % to 95 %, non-condensing
	Maximum operating elevation	2000 m
Installation conditions		
	Circuit breaker in supply line	CB 6 A, characteristic B, interrupt rating 6 kA
Size	Dimensions	90 x 72 x 62 mm (H x W x D)
Mounting	Top-hat rail	Support rail 35 x 7 mm compliant with EN 60715
Weight		195 g
Communications interfaces	2.402 GHz – 2.480 GHz	For portable communications equipment
	LAN	Ethernet 10Base-T RJ45
User interface	Buttons	Start, Time, Stop
	LEDs	1x green, 1x yellow, 1x red; 12 V; max. 12 mA
Control signals	Contactor drive	230 V, max. 3 A
	CP	Output for max. charging power control signal
	PP	Input for charging cable current capacity detection
	S0	Digital input 12 V; S0 electricity meter signal, 1600 pulse/kWh
	voltage monitoring	Digital input 12 V
	RCD status feedback	Digital input 12 V

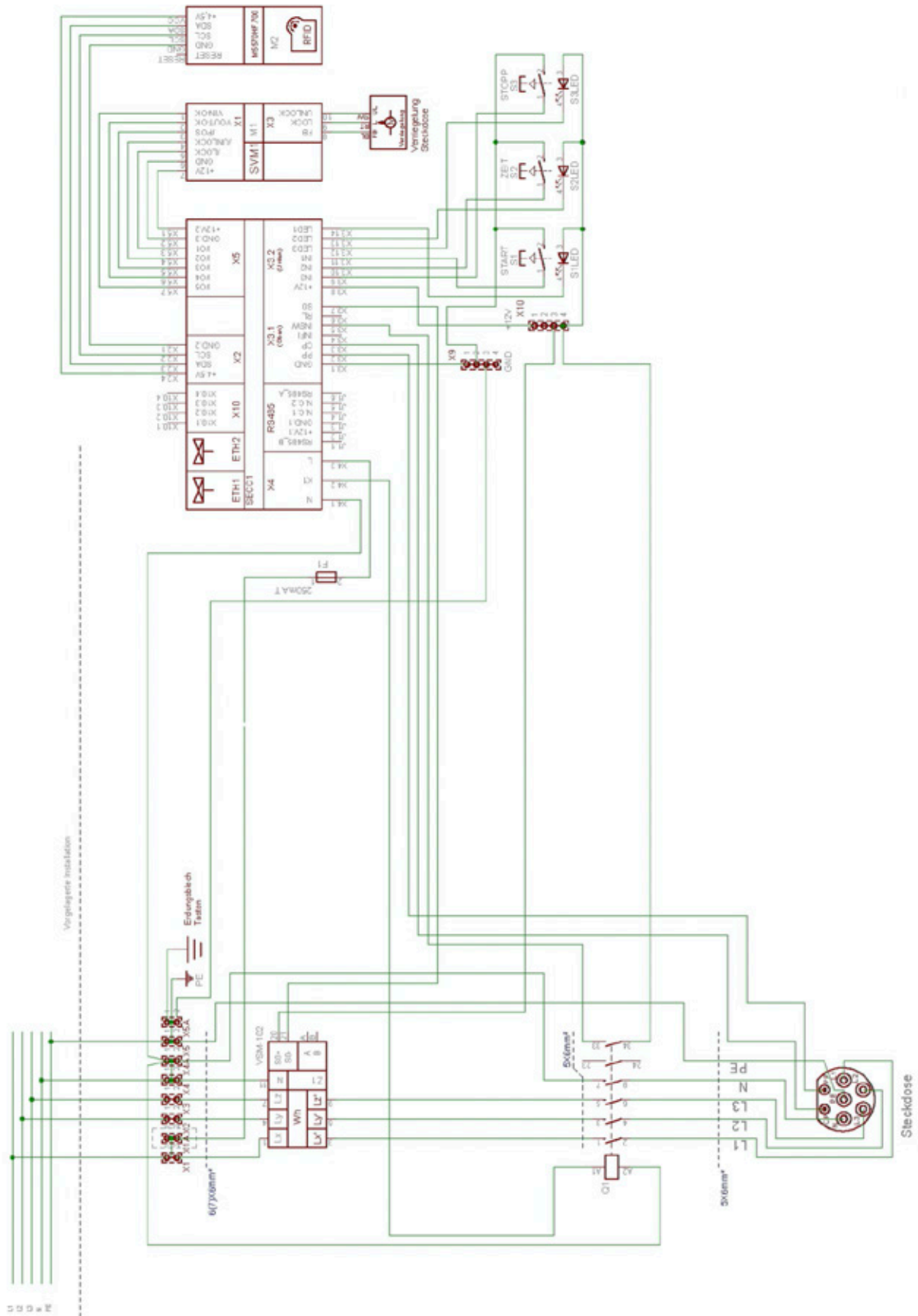| Relevant standards		EN 61851-1, -21, -22
Linux operating system	Processor type	Cortex-A5 / SAMA5D3
	RAM	128 Mbyte
	Flash memory	128 Mbyte (approx. 70 MB free)
	System clock	528 MHz

Available accessories

- 3-phase meter

- RFID reader

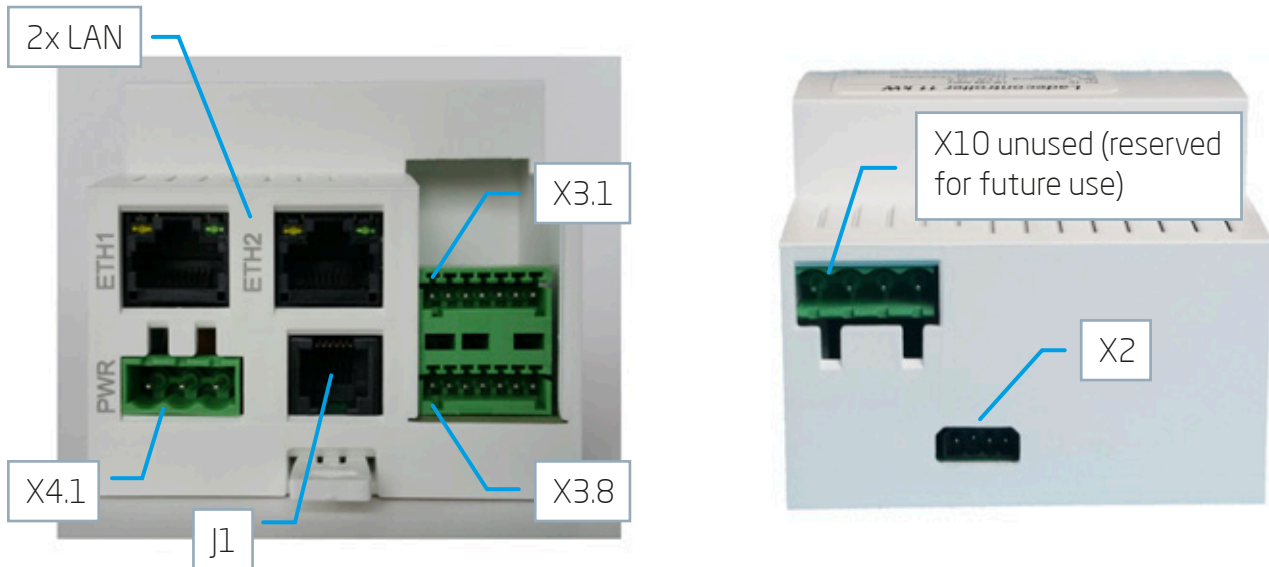- Unlocking module for outlets

Application circuit

Charging station with attached charging cable
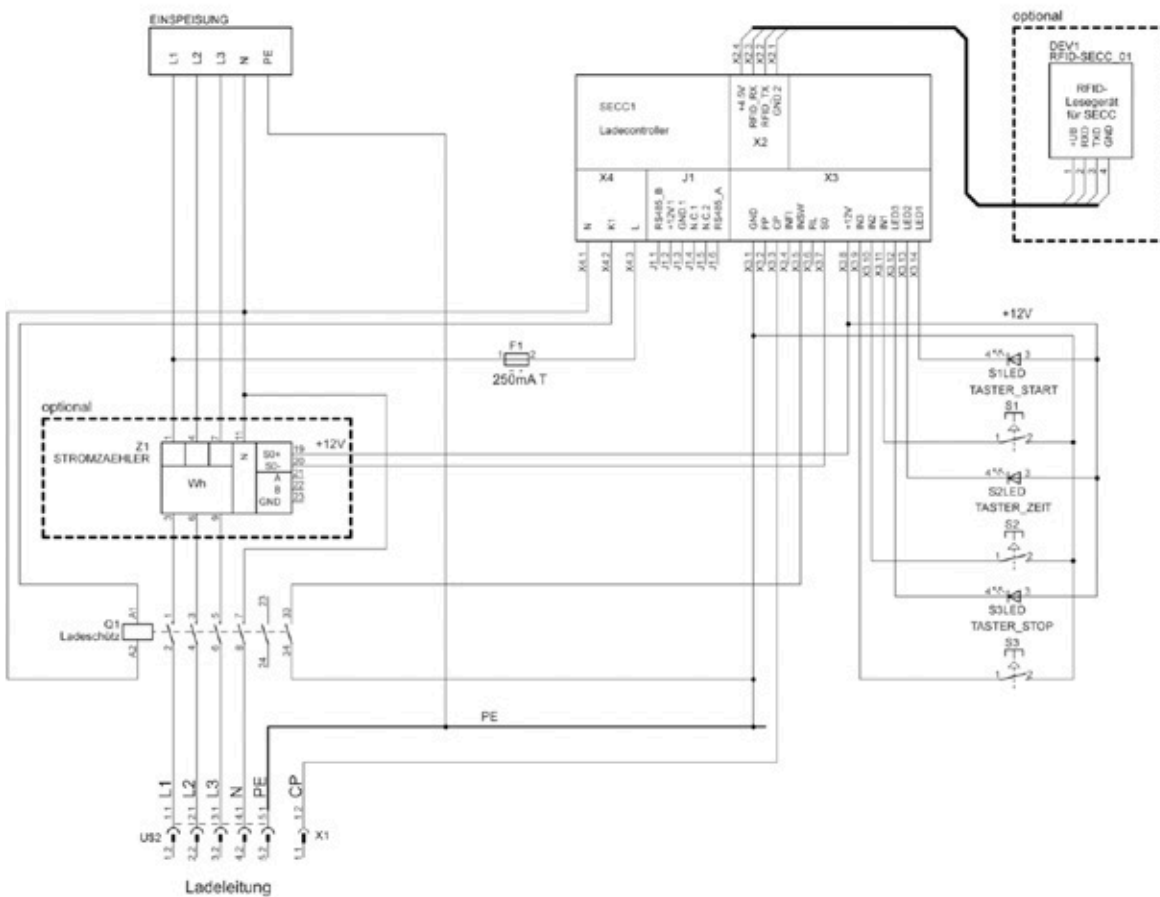
Charging station with outlet

Connectors overview

X2

X2 is provided for connection of a device-specific RFID reader. The form factor and signal pin assignments are laid out accordingly. Other RFID readers cannot and may not be connected.

X3

X3 specification

	Specification
Connector	Manufacturer: Phoenix Contact Type: PCB connector FK-MC 0,5/ 7-ST-2,5 Part number: 1881370
Positions	7
Connection method	Push-in spring connection
Clamping range	max. 0.5 mm²

X3 pin assignments

PIN	Signal	Designation	Function
X3.1	GND	I/O reference potential	Reference potential
X3.2	PP	Input for charging cable detection	Determination of charging cable current capacity
X3.3	CP	Control signal	Electric vehicle communications
X3.4	INFI	Input for RCD status	Fault signal (separate power supply required); active low; Optionally configurable

X3.5	INSW	Input for contactor mirror contact	Fault signal; active low Optionally configurable
X3.6	RL	Power failure input	Detection of power outages; active low
X3.7	S0	S0 input	Link to electricity meter (1600 pulse/kWh)
X3.8	+12 V	I/O supply voltage	LED supply voltage
X3.9	IN3	Stop button input	Stop button signal input; active low
X3.10	IN2	Time button input	Time button signal input; active low
X3.11	IN1	Start button input	Start button signal input; active low
X3.12	LED3	LED3 output	LED3 drive; 12 V, max. 12 mA
X3.13	LED2	LED2 output	LED2 drive; 12 V, max. 12 mA
X3.14	LED1	LED1 output	LED1 drive; 12 V, max. 12 mA

X4

X4 specification

	Specification
Connector	Manufacturer: Phoenix Contact; Type: PCB connector FKCN 2,5/ 3-ST-5,08 Part number 1754571
Positions	3
Connection method	Push-in spring connection
Clamping range	max. 2.5 mm²

X4 pin assignments

PIN	Signal	Description	Function
X4.1	N	Neutral conductor	Supply voltage 230 V / 50 Hz
X4.2	K1	Output for contactor	Contactor drive 230 V, max. 6 A
X4.3	L	Line conductor 230 V, max. 6 A	Supply voltage

X10

X10 is not used. No signal lines may be connected. Voltages above 24 V DC will damage the device.

X10 specification

	Specification
Connector	Manufacturer: Phoenix Contact; Type: PCB connector FKCN 2,5/ 4-ST-5,08 - 1754584 Part number 1754584
Positions	4
Connection method	Push-in spring connection
Clamping range	max. 1.5 mm²

X10 pin assignments

PIN	Signal	Description	Function
X10.1	A1	Optocoupler 1 anode	Not used (reserved for future use)
X10.2	K1	Optocoupler 1 cathode	Not used (reserved for future use)
X10.3	A2	Optocoupler 2 anode	Not used (reserved for future use)
X10.4	K2	Optocoupler 2 cathode	Not used (reserved for future use)

LAN

Connector	Description	Connector specification
ETH0	Fixed IP address 19.168.178.10	RJ45
ETH1	Accept IP address from a DHCP server	RJ45

J1

RJ45 port for connecting a VSM 102 meter.

J1 specification

	Specification
Outlet	Manufacturer: Assmann Type: RJ11-6L Part number: A-2004-1-4-LP-N
Positions	6

J1 pin assignments

PIN	Signal	Description	Function
J1.1	B	RS485 data line B	Meter communications
J1.2	+12 V	Supply voltage	Not used (reserved for future use)
J1.3	GND	Reference potential	Reference potential
J1.4	D	Signal not used Max. input voltage +5 V DC	Not used (reserved for future use)
J1.5	---	Not connected	Not used
J1.6	A	RS485 data line A	Meter communications

User interface

Buttons

Button	Function
START	Start the charging process. (The charging mode selected with the <Select charging mode> button is used by default.)
TIME	By pressing the button, the user can select either immediate charging or controlled charging.
STOP	Stops the current charging process; locks the outlet.

LEDs

LED	Indication function	Off	On	Blinking
LED1	Charging indication	Charging off	Charging active	Vehicle connected
LED2	Selected charging mode indication	Immediate charging	Scheduled charging	Minimum-cost charging
LED3	Fault status indication	System operation OK	Fault	

Other system states are shown by the LEDs in combination.

Functional description

Control

The SECC 01 charge controller implements all required control tasks for an AC charging station according to EN 61851-1 charging modes 2 and 3, which specifies communications with a compatible electric vehicle by means of a pulse width modulated signal (CP) for the purpose of initiating, carrying out and concluding the charging process.

The charging process is only started if the connected charging cable has sufficient current capacity as detected by the PP signal. Use of the PP signal is not required in the case of a permanently attached charging cable.

Three signal lines are available for a user interface in the form of buttons and LEDs.

Charging modes

The charge controller can control charging processes in various ways in terms of time and power. The following charging modes can be selected:

- Charge the electric vehicle with maximum power as quickly as possible (Immediate charging)

- Charge only during low-rate times to minimize energy costs (Minimum-cost charging)

- Cost-optimized charging taking into account a planned departure time and rate times (Scheduled charging)

Immediate charging

After the charging process is started by pressing the Start button, charging of the electric vehicle starts immediately with maximum power. Maximum possible power to the vehicle is assured during the entire charging process.

LED2 is off for Immediate charging.

Minimum-cost charging

In this mode the charging process is only enabled during low-rate times with maximum permissible power. The charging process is interrupted during high-rate times.

Scheduled charging can be selected by pressing the Time Control button or by a command over the other available communications channels of the charging box. This charging mode is indicated by LED2 blinking slowly.

Scheduled charging

If a known departure time must be taken into account in scheduling the charging process, the Scheduled charging mode should be used.

With automatic scheduling of the charging process, rate times are taken into account to minimize the cost while ensuring compliance with the departure time.

Depending on the selected departure time, charging during high-rate times may also be necessary.

Scheduled charging mode is only available when the APP for mobile communications devices is used. A prerequisite for using this charging mode is configuration of rate times and interruption times (if any).

Selection of Scheduled charging mode is indicated by LED2 constantly on.

Note: A valid system time is required for Scheduled charging and Scheduled charging. This can be set automatically through a LAN connection to an NTP server or through the wireless communications interface using a mobile data communication device and a dedicated APP. Alternatively, it can be set manually via the web interface for system configuration.

Communications interfaces

Wireless communications interface

The charge controller has a wireless communications interface with an integrated antenna. This wireless connection is used for configuration and operation with a mobile device, such as a smartphone.

For installation of the SECC 01 it should be borne in mind that a metallic charging station enclosure can impair signal reception due to the integrated antenna.

The mode of operation of the wireless communications interface is described in a separate document.

Bluetooth 4.0

The Android operating system supports this interface from version 4.3 (mid-2013) onward. The Apple iOS operating system support this interface from iOS 5 onward with the Core-Bluetooth framework released in October 2011.

WLAN

The WLAN interface enables easy access to the charge controller for configuration, maintenance and data exchange.

LAN

The charge controller has two jacks for connection to a local area network, implemented with the usual RJ45 connectors. The maximum data transmission rate is 10 Mbit/s.

The network address of the ETH 1 port is automatically acquired from a DHCP server.
The ETH 0 network port is configured with a fixed IP address (192.168.178.10).

Communications with the charge controller for remote maintenance uses SSH via port 25122.

RFID

The charge controller has a port for an RFID reader (X2), which is available as an accessory.

The RFID reader is powered from the charge controller. A separate power supply is not required.

If a reader is configured, the charging function can be enabled temporarily by means of a registered RFID card. This is a prerequisite for operation using the buttons or starting the charging process by the charging station user.

Meter link

A meter is always required when the intelligent control features of the charge controller are used or the energy consumption must be reported to a higher-level backend system.

Meter link over S0

Meter readings are accepted over the S0 interface. The default configuration is 1600 pulses per kilowatt-hour. Other values can be set using the web interface.

Meter link over RS485

A type VSM 102 rail-mounted electronic meter can be connected via the J1 port. This connection allows readout of the individual registers, making additional information available.

On request, the firmware of the charge controller can be modified for other meter types.

Abbreviations

LAN   Local Area Network

RFID   Radio Frequency Identification

SECC   Supply Equipment Communication Controller

sVE   Controllable appliance according to Section 14a EnWG (Energy Industry Act)
                Controllable appliances are fixed electrical loads on the low-voltage grid
                whose energy consumption is exclusively controlled by the grid operator
                by means of a control device (similar to power supply for heat pumps).

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