CHARGE AMPS

OCPP API Documentation
- Charge Amps Aura

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1. About this document

1.1. Summary

This document describes the OCPP API support of the Charge Amps Aura EVSE.
The target audience of this document is technical staff performing direct integration Aura EVSEs into their CPMS.

1.2. Changelog

FW version	Description
127	First release of this document.
133	Update for firmware version 133; add High Level Supervision keys.
134	No changes
138	No changes
138 revision 2	Additional information on Remote Debug and Security profiles
140	No changes
141	Update defaults for HlSuperv and HlSupervCharge
	Update on UserCurrent, AssignedCurrent and AssignedPhase
142	Adjust limit on HlSuperv
143	No changes
144	Add DataTransfer ChargingLimitations
145	No changes
146	No changes
147	Update firmware image download location
148	No changes
149	No changes
150	No changes
151	Added two more limitations to DataTransfer MessageId ChargingLimitations: Overheat Limit and State Restriction ID
153	No changes
154	No changes
155	No changes
156	No changes

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1.3. Acronyms

Acronym	Description
CPMS	Chargepoint Management System. Also known as CSMS, Charging Station Management System.
EVSE	Electric Vehicle Supply Equipment
LMI	Local Management Interface. For local connection to and configuration of the EVSE using a Wi-Fi hotspot of the EVSE or over a local network.
OCA	Open Charge Alliance
OCPP	Open Charge Point Protocol, specified by OCA.

1.4. References

Nr	Description	Link
1	OCPP 1.6 specification from Open Charge Alliance	https://www.openchargealliance.org/protocols/ocpp-16/

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2. OCPP Compliance

OCPP version supported: **OCPP-J 1.6**

2.1. Supported feature profiles

The following feature profiles of OCPP 1.6 are supported.

Profile Name	Supported	Comments
Core	**YES**	
Firmware Management	**YES**	
Local Auth List Management	**YES**	
Reservation	**NO**	
Smart Charging	**PARTLY**	See Deviations.
Remote Trigger	**PARTLY**	See Deviations.

2.2. Security Profiles

2.2.1. Default behavior

A newly installed Aura EVSE without any change to its configuration has the following default behavior when initializing its connection to the OCPP server.

Security Aspect	Default Behavior
Encryption (TLS)	Controlled by protocol scheme in the *Server* configuration key. E.g., “ws:” or ”wss:”
Charge Point Authentication	None.
Central System Authentication	Using non-verified server-side certificate.

Defaults for security related configuration keys:

Configuration Key	Default Value
ChargePointId	Serial number of the EVSE
AuthorizationKey	“”
Server	*wss://ocpp.charge.space/ocpp*

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2.2.2. Increasing security

The standard OCPP key *AuthorizationKey* contains the password used in basic authentication, where the EVSE authenticates itself towards the CPMS using a username and password.
By default, the *AuthorizationKey* is empty and by configuring it from the CPMS, the EVSE will start using basic authentication when connecting to the CPMS, using the configured *AuthorizationKey* as the password and the *ChargePointID* as the username.

AuthorizationKey	
Description	Password used for basic authentication when the EVSE connects to the OCPP server. Reading this key will always return an empty string for security reasons.
Read/Write	W
Type	String, 16 to 20 bytes long. Represented as 32 to 40 hexadecimal digits.
Values	-
Default	- (no default)

2.2.3. Recommendations

For security profile level 2, the installed certificate is limited by the available hardware resources. Certificate key size is recommended to be maximum 2048 bit. Server certificate chain is recommended to be up total of three certificates excluding the installed certificate. Variations of key size and number of certificates in the certificate chain is possible but should be thoroughly tested.

2.3. Meter values

The EVSE supports sampled meter data, which is frequently (per default every 30 seconds) sent to the central system in *MeterValues* messages during an ongoing transaction. At the end of the transaction the *StopTransaction* message includes the final meter value of the connector when charging stopped.

Clock aligned meter values for temperature measurement are supported.

2.4. Firmware Upgrade

New firmware packages, ***AURA_FW_UPGRADE_####***, can be retrieved from Charge Amps web https://www.chargeamps.com/firmware-updates/.

Supported file transfer protocols for downloading new firmware packages: **FTP**

2.5. Get Diagnostics

The output of a GetDiagnostics operation is an EVSE log file for more advanced troubleshooting.

Supported file transfer protocols for uploading diagnostics: **FTP**

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3. Vendor extensions

3.1. Vendor-specific data transfer messages

There are no implemented custom data transfer messages except for internal troubleshooting by Charge Amps while connected to Charge Amps CPMS.

3.2. Custom configuration keys

This section specifies the custom configuration keys added by Charge Amps on top of the standard configuration keys from OCPP specification.

3.2.1. Read-only capabilities of the EVSE

MaxCurrent	
Description	Maximum current that can be delivered by the EVSE.
Read/Write	R
Type	CSL
Values	-
Default	0.64,1.32,2.32

MaxPhases	
Description	Maximum number of phases for the EVSE.
Read/Write	R
Type	Integer
Values	-
Default	3

ACPhaseSwitchingSupported	
Description	Informs that the EVSE supports selection of and switching between phases for 1-phase charging and supports the *phaseToUse* property in smart charging profiles.
Read/Write	R
Type	Boolean
Values	-
Default	true

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HardwareVersion	
Description	Hardware version of the charge point.
Read/Write	R
Type	String
Values	-
Default	-

FirmwareVersion	
Description	Current installed firmware version.
Read/Write	R
Type	String
Values	-
Default	-

3.2.2. Connectivity and communication

ManagementInterface	
Description	Control availability of the local management interface, LMI. When disabled, local access though both the EVSE built-in Wi-Fi access point and over the local network is disabled. *Note:* If disabled, the only way to access the EVSE is over the OCPP interface. In case of lost OCPP connection there would be no way to troubleshoot or perform a factory reset.
Read/Write	RW
Type	Integer
Values	0 – Disabled 1 – Enabled >2 – Enabled for these many seconds after boot.
Default	1

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WifiSSID	
Description	SSID for the local Wi-Fi network the EVSE shall connect to.
Read/Write	RW
Type	String, max length 32 characters.
Values	-
Default	-

WifiPassword	
Description	Password for the local Wi-Fi network the EVSE shall connect to. Reading this key will always return an empty string for security reasons.
Read/Write	W
Type	String, max length 32 characters.
Values	-
Default	-

For both Wi-Fi SSID and password, due to a limited character set in the local management interface of the EVSE, limiting the used characters to alphanumerical characters is recommended.

Server	
Description	OCPP-J endpoint URL for the EVSE to connect to.
Read/Write	RW
Type	String, max length 63 characters.
Values	-
Default	wss://ocpp.charge.space/ocpp

As default, the *Server* configuration key points to the endpoint URL of the Charge Amps CPMS. To manage an EVSE with another CPMS, this key needs to be changed. Apart from changing it over OCPP from the CPMS that is currently managing the EVSE, this can also be configured using the local management interface.

ChargePointID	
Description	ID of the EVSE used in OCPP communication and authentication.
Read/Write	RW
Type	String, max length 20 characters
Values	-
Default	The EVSE serial number.

The ChargePointID is the ID used by the charge point to identify itself.

- It is used as the username in basic authentication.
- It is used in the connection URL towards the OCPP server and each charge point within the OCPP server must have a unique ChargePointID.

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Special care must be taken when considering changing this configuration key. To guarantee uniqueness within the set of charge points of the CPMS is the responsibility of the CPMS performing the change.

RetryBackOffRepeatTimes	
Description	When OCPP connectivity is lost, the EVSE tries to reconnect after a delay and at each reconnection attempt the previous delay is doubled. After *RetryBackOffRepeatTimes* unsuccessful reconnection attempts, the EVSE will continue to attempt reconnection using the final delay.
Read/Write	RW
Type	Integer
Values	<0-65535>
Default	5

RetryBackOffRandomRange	
Description	Add a new random value to every increasing back-off time in seconds.
Read/Write	RW
Type	Integer
Values	<0-65535>
Default	10

RetryBackOffWaitMinimum	
Description	After a connection loss, it will use this variable as the minimum backoff time in seconds, first time trying.
Read/Write	RW
Type	Integer
Values	<0-65535>
Default	30

If both *RetryBackOffWaitMinimum* and *RetryBackOffRandomRange* are set to 0, then the EVSE will attempt to reconnect every 1 second.

HlSuperv	
Description	High level supervision timeout in seconds. The used value is the maximum value of HlSuperv key value and HeartbeatInterval + 2x [Network backoff retry intervals]
Read/Write	RW
Type	Integer
Values	<0,300-2147483647> 0=disabled
Default	3600

HlSupervCharge

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Description	High level supervision timeout during charging in seconds. The used value is the maximum value of HlSupervCharge key value and HeartbeatInterval + 2x [Network backoff retry intervals]
Read/Write	RW
Type	Integer
Values	<0,300-2147483647> 0=disabled
Default	86400

High Level Supervision monitors connectivity with OCPP server. The EVSE restarts when timeout is reached without any communication.

Both *HlSuperv* and *HlSupervCharge* must be set to 300 seconds or more to activate supervision.

3.2.3. EVSE Functional Behavior

CableLock	
Description	Enable/Disable permanent cable lock, individually for connector 1 and connector 2. Enabling permanent cable lock overrides *UseLegacyLock.*
Read/Write	RW
Type	CSL
Values	1.<0|1>,2.<0|1> 0 – Disabled 1 – Enabled
Default	1.0,2.0

UseLegacyLock	
Description	Control cable locking behavior.
Read/Write	RW
Type	Boolean
Values	true – Charging cable is only locked during active charging (Legacy proprietary behavior). false – Charging cable is locked during an entire transaction (OCPP behavior).
Default	false

FreeCharging	
Description	Enable/Disable free charging mode per connector, in which no authorization is required to start charging. Charging is started directly when an EV is connected. Can only be changed when there is no active transaction.
Read/Write	RW
Type	CSL

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Values	0 – Free charging is disabled 1 – Free charging is enabled
Default	1.1,2.1

RfidTagFreeCharging	
Description	RFID used by the EVSE towards central system for transactions when free charging is enabled.
Read/Write	RW
Type	String, max length 20 characters
Values	-
Default	00000000000000

AssignedPhase	
Description	Configuration of the phase or phases which the EVSE shall use, per connector. This key is ignored when smart charging profile is used.
Read/Write	RW
Type	CSL
Values	1.<L1|L2|L3|L123>,2.<L1|L2|L3|L123>
Default	If *InstallationPhases* = 1: 1.L1,2.L1 If *InstallationPhases* = 3: 1.L123,2.L123

AssignedCurrent	
Description	Configuration of the current assigned to each connector. This key is ignored when smart charging profile is used.
Read/Write	RW
Type	CSL
Values	1.<0-*InstallationCurrent*(1)>,2.<0-*InstallationCurrent*(2)>
Default	1.32,2.32

UserCurrentLimit	
Description	Current limit set by the end-user 0=charging suspended by EVSE
Read/Write	RW
Type	CSL
Values	1.<0,6-*InstallationCurrent*>,2.<0,6-*InstallationCurrent*>
Default	1.32,2.32

WakeupEnable	
Description	Wake-up signalling after long period of inactivity for legacy EVs (IEC 61851-1:A.5.3)
Read/Write	RW
Type	Boolean

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Values	true – Enabled false – Disabled
Default	false

3.2.4. Electrical installation configuration

The following configuration keys are protected and require authentication with the EVSE specific PIN code to enable configuration changes to them. When setting the EVSE specific PIN code to the configuration key *InstallationChange* using a ChangeConfiguration request, a 60 second window is opened during which the protected configuration keys can be changed.

InstallationChange	
Description	Enables writability of the *InstallationCurrent, InstallationPhases, InstallationOfflinePhase,* and *InstallationOfflineCurrent* configuration keys. A GetConfiguration operation for this key will always return an empty string for security reasons. The PIN code (per EVSE) must be communicated to the CPMS using a channel outside of OCPP.
Read/Write	W
Type	String of 8 digits.
Values	EVSE PIN code
Default	-

InstallationCurrent	
Description	Maximum current that can be used by the EVSE, limited by the electrical installation. Can only be changed after *InstallationChange* has been correctly set.
Read/Write	R(W)
Type	Integer
Values	0.<6-64>,1.<6-32>,2.<6-32>
Default	0.64,1.32,2.32

InstallationPhases	
Description	Number of phases installed. Can only be changed after *InstallationChange* has been correctly set.
Read/Write	R(W)
Type	Integer
Values	1|3
Default	3

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InstallationOfflinePhase	
Description	Phase(s) to use when charging in an offline state, i.e., while not connected to the CPMS and without option to use dynamic load balancing. When offline, this setting is used instead of AssignedPhase.
Read/Write	R(W)
Type	CSL
Values	1.<L1|L2|L3|L123>,2.<L1|L2|L3|L123>
Default	If *InstallationPhases* = 1: 1.L1,2.L1 If *InstallationPhases* = 3: 1.L123,2.L123

InstallationOfflineCurrent	
Description	Current to use when charging in an offline state, i.e., while not connected to the CPMS and without option to use dynamic load balancing. When offline, this setting is used instead of AssignedCurrent.
Read/Write	R(W)
Type	CSL
Values	1.<0-32>,2.<0-32>
Default	1.32,2.32

3.2.5. Charge Amps Internal

The following custom configuration keys are exposed by the EVSE but are not relevant for other CPMS systems than the Charge Amps CPMS and should be ignored by 3rd party integrations.

RemoteDebug	
Description	Control of logging level on the EVSE.
Read/Write	RW
Type	String
Values	-
Default	0,E,0x0

CAServiceNetworks	
Description	When enabled, the EVSE will automatically attempt to connect to the Charge Amps production network if it is available, provided that the user configured *WifiSSID* is not available.
Read/Write	RW
Type	Boolean
Values	true | false
Default	true

WeldCheck	
Description	Enable/Disable of relay weld detection

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Read/Write	RW
Type	Enum
Values	0 – Off 1 – On
Default	1

ReportPWM	
Description	Send PWM data as DataTransfer messages to the server
Read/Write	RW
Type	Boolean
Values	true | false
Default	false

3.3. Custom DataTransfer

This section specifies the custom DataTransfer added by Charge Amps.

3.3.1. Backend requested

networkStatus	
Description	Request a string of json encoded information on the network connectivity status.
DataTransfer.req - vendorId - messageId - data (optional)	 'com.chargeamps' 'networkStatus' ''
DataTransfer.conf - status - data	 Accepted | Rejected | UnknownMessageId Serialized json
Example data (only information on interface eth or wlan populated depending on interfaceUsed	"version":1, "interfaceUsed":"eth", "interfaces":[{"interfaceName":"eth", "ipAddress":"192.168.0.9", "macAddress":"4C:BC:98:00:96:22", "connectionType":"FixedLAN"}, {"interfaceName":"wlan", "ssid":"<SSID>", "ipAddress":"192.168.0.10", "rssi":-65, "channel":1, "macAddress":"4C:BC:98:00:96:23", "connectionType":"WiFi",

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	"apMacAddress":"4C:BC:98:00:96:24"}]}
RcdTestConN	
Description	Request an RCD trip test for connector N. Requires charging vehicle.
DataTransfer.req - vendorId - messageId - data (optional)	 'com.chargeamps' 'RcdTestCon1'|'RcdTestCon2' ''
DataTransfer.conf - status	 Accepted | Rejected | UnknownMessageId

RcdTestConN	
Description	Request an RCD trip test for connector N. Requires charging vehicle.
DataTransfer.req - vendorId - messageId - data (optional)	 'com.chargeamps' 'RcdTestCon1'|'RcdTestCon2' ''
DataTransfer.conf - status	 Accepted | Rejected | UnknownMessageId

Charging Limitations		
Description	Request a list of charging limitations for current and phase.	
DataTransfer.req - vendorId - messageId - data (optional)	 'com.chargeamps' 'ChargingLimitations' 'connectorId': 1|2	
DataTransfer.conf - status - data	 Accepted | Rejected | UnknownMessageId 'version': 1 'connectors': [{ 'connectorId': 1|2 'currentOffered': 6-32 'phasesOffered': 1|3 'limitations': [{ 'limitationId': 1 'limitationName': "HW Limit" 'current': 6-32 'phases': 1|3 }	
LimitationId	**LimitationName**	**Description**
1	HW Limit (i.e. Configuration keys MaxCurrent and NumberOfPhases)	Current and Phase Limitation Different for different HW models
2	Installation Limit	Current and Phase Limitation

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3	Assigned Limit	Current and Phase Limitation
4	User Limit	Current Limitation
5	TxDefaultProfile	Current and Phase Limitation
6	TxProfile	Current and Phase Limitation
7	CPMaxProfile	Current and Phase Limitation
8	Temperature Limit	Current Limitation
9	Cable Limit	Current Limitation
10	Simplified Limit	Current and Phase Limitation
11	Internal Load Balancing	Current Limitation (not used in Halo/Dawn/Luna)
12	Overheat Limit	[AURA] Current Limitation due to connector overheat
13	State Restriction ID	Charging restricted due to internal state restriction.

3.3.2. Device generated

RcdCalibrationFailure	
Description	RCD Calibration fault information. This example is from a normal condition.
DataTransfer.req - vendorId - messageId - data	 'com.chargeamps' 'RcdCalibrationFailure' Serialized json (see example)
Example data	"connector":1, "coefficient":40, "pos_calib":199, "neg_calib":-199,

RcdTripInformation	
Description	RCD information when RCD tripped by fault or triggered by test.
DataTransfer.req - vendorId - messageId - data	 'com.chargeamps' 'RcdTripInformation' Serialized json (see example)
Example data	"connector":1, "zero":16375, "tripTime":27, "measurements":[4, -23, 6, -1, 1, 2, 6, 4, -11, -2, -2, 1, 5, 6, 127, -128, -2, -1, 1, 4, 5, 9, -21, -2, -1, 3, 8, 5, -14, -2]

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4. Deviations

1. The *GetCompositeSchedule* operation of the SmartCharging feature profile is not supported.

2. TriggerMessage requests from the OCPP server for the specific requestMessage *DiagnosticsStatusNotification* is not supported.
   All other TriggerMessage request types are supported.

3. Changing the OCPP configuration key *ConnectorPhaseRotation* using a ChangeConfiguration operation has no actual effect.

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