



**OCPP 2.0.1**  
Part 2 - Appendices

FINAL, 2020-03-23

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# Disclaimer

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## Version History

Appendix version	Date	OCPP Version	Author	Description
1.1	2020-03-23	OCPP 2.0.1	Franc Buve (OCA) Milan Jansen (OCA) Robert de Leeuw ( <i>ihomer</i> )	Update for OCPP 2.0.1
1.0	2018-04-11	OCPP 2.0	Franc Buve (OCA) Milan Jansen (OCA) Robert de Leeuw ( <i>ihomer</i> )	First release of this Appendix for OCPP 2.0

## Appendix 1. Security Events

The table below provides a list of security events. Security events that are marked critical should be pushed to the CSMS. This is a non-exhaustive list of security events, when a security event matches the *description* of one of the Security Events in this section, for interoperability reasons, the Security Event from this section SHALL be used, instead of adding a new (proprietary) Security Event.

Security Event	Description	Critical
FirmwareUpdated	The Charging Station firmware is updated	Yes
FailedToAuthenticateAtCsms	The authentication credentials provided by the Charging Station were rejected by the CSMS	No
CsmsFailedToAuthenticate	The authentication credentials provided by the CSMS were rejected by the Charging Station	No
SettingSystemTime	The system time on the Charging Station was changed more than <code>ClockCtrlr.TimeAdjustmentReportingThreshold</code> seconds	Yes
StartupOfTheDevice	The Charging Station has booted	Yes
ResetOrReboot	The Charging Station was rebooted or reset	Yes
SecurityLogWasCleared	The security log was cleared	Yes
ReconfigurationOfSecurityParameters	Security parameters, such as keys or the security profile used, were changed	No
MemoryExhaustion	The Flash or RAM memory of the Charging Station is getting full	Yes
InvalidMessages	The Charging Station has received messages that are not valid OCPP messages, if signed messages, signage invalid/incorrect	No
AttemptedReplayAttacks	The Charging Station has received a replayed message (other than the CSMS trying to resend a message because it there was for example a network problem)	No
TamperDetectionActivated	The physical tamper detection sensor was triggered	Yes
InvalidFirmwareSignature	The firmware signature is not valid	No
InvalidFirmwareSigningCertificate	The certificate used to verify the firmware signature is not valid	No
InvalidCsmsCertificate	The certificate that the CSMS uses was not valid or could not be verified	No
InvalidChargingStationCertificate	The certificate sent to the Charging Station using the <code>CertificateSignedRequest</code> message is not a valid certificate	No
InvalidTLSVersion	The TLS version used by the CSMS is lower than 1.2 and is not allowed by the security specification	No
InvalidTLSCipherSuite	The CSMS did only allow connections using TLS cipher suites that are not allowed by the security specification	No

## Appendix 2. Standardized Units of Measure

The standardized values for Unit of Measure. Default value of "unit" is always "Wh".

Value	Description
<b>A</b>	Amperes (current)
<b>ASU</b>	Arbitrary Strength Unit (Signal Strength)
<b>B</b>	Bytes
<b>Celsius</b>	Degrees (temperature)
<b>dB</b>	Decibel (for example Signal Strength)
<b>dBm</b>	Power relative to 1mW ( $^{10}\log(P/1mW)$ )
<b>Deg</b>	Degrees (angle/rotation)
<b>Fahrenheit</b>	Degrees (temperature)
<b>Hz</b>	Hertz (frequency)
<b>K</b>	Degrees Kelvin (temperature)
<b>lx</b>	Lux (Light Intensity)
<b>m</b>	Meter (length)
<b>ms<sup>2</sup></b>	m/s <sup>2</sup> (Acceleration)
<b>N</b>	Newtons (Force)
<b>Ohm</b>	Ohm (Impedance)
<b>kPa</b>	kiloPascal (Pressure)
<b>Percent</b>	Percentage
<b>RH</b>	Relative Humidity%
<b>RPM</b>	Revolutions per Minute
<b>s</b>	Seconds (Time)
<b>V</b>	Voltage (DC or r.m.s. AC)
<b>VA</b>	Volt-Ampere (apparent power)
<b>kVA</b>	kiloVolt-Ampere (apparent power)
<b>VAh</b>	Volt-Ampere-hours (apparent energy)
<b>kVAh</b>	kiloVolt-Ampere-hours (apparent energy)
<b>var</b>	vars (reactive power)
<b>kvar</b>	kilovars (reactive power)
<b>varh</b>	var-hours (reactive energy)
<b>kvarh</b>	kilovar-hours (reactive energy)
<b>W</b>	Watts (power)
<b>kW</b>	kilowatts (power)
<b>Wh</b>	Watt-hours (energy). Default
<b>kWh</b>	kilowatt-hours (energy)

## Appendix 3. Standardized Components

### 3.1. Controller Components

This is the list of Standardized Controller Components for OCPP 2.0. and typical Variables that might be associated with them. This list does not imply that these Components are required, nor does it imply that the listed Variables are required for a Component or no other Variables are allowed to be associated with a Component.

#### 3.1.1. AlignedDataCtrlr

Description		
Logical Component responsible for configuration relating to the reporting of clock-aligned meter data.		
Variables	Type	Description
Enabled	boolean	If this variable reports a value of true, Aligned Data is enabled.
Available	boolean	If this variable reports a value of true, Aligned Data is supported.
Interval	integer	Size (in seconds) of the clock-aligned data interval, intended to be transmitted in the MeterValuesRequest message.
Measurands	MemberList	Clock-aligned measurand(s) to be included in MeterValuesRequest, every AlignedDataInterval seconds.
SendDuringIdle	boolean	If set to true, the Charging Station SHALL not send clock aligned meter values when a transaction is ongoing.
SignReadings	boolean	If set to true, the Charging Station SHALL include signed meter values in the TransactionEventRequest to the CSMS.
TxEndedInterval	integer	Size (in seconds) of the clock-aligned data interval, intended to be transmitted in the TransactionEventRequest (eventType = Ended) message.
TxEndedMeasurands	MemberList	Clock-aligned periodic measurand(s) to be included in the meterValues element of TransactionEventRequest (eventType = Ended) for every TxEndedAlignedDataInterval of the transaction.

#### 3.1.2. AuthCtrlr

Description		
Logical Component responsible for configuration relating to the use of authorization for Charging Station use.		
Variables	Type	Description
Enabled	boolean	If this variable reports a value of true, Authorization is enabled.
AdditionalInfoItemsPerMessage	integer	Maximum number of AdditionalInfo items that can be sent in one message.
OfflineTxForUnknownIdEnabled	boolean	If this key exists, the Charging Station supports Unknown Offline Authorization.
AuthorizeRemoteStart	boolean	Whether a remote request to start a transaction in the form of RequestStartTransactionRequest message should be authorized beforehand like a local action to start a transaction.
LocalAuthorizeOffline	boolean	Whether the Charging Station, when Offline, will start a transaction for locally-authorized identifiers.
LocalPreAuthorize	boolean	Whether the Charging Station, when online, will start a transaction for locally-authorized identifiers without waiting for or requesting an AuthorizeResponse from the CSMS.
MasterPassGroupId	string	IdTokens that have this id as groupId belong to the Master Pass Group.

#### 3.1.3. AuthCacheCtrlr

Description		
Logical Component responsible for configuration relating to the use of a local cache for authorization for Charging Station use.		
Variables	Type	Description
Enabled	boolean	If this variable exists, the Charging Station supports an Authorization Cache.

Description		
Available	boolean	If this variable reports a value of true, Authorization Cache is supported.
LifeTime	integer	Indicates in seconds how long it takes until a token expires in the authorization cache since it is last used.
Policy	OptionList	Cache Entry Replacement Policy: (LRU,LFU) LeastRecentlyUsed or LeastFrequentlyUsed. Allowed values: LRU, LFU.

### 3.1.4. CHAdeMOCtrlr

Description	
A CHAdeMO Controller component communicates with an EV using the wired CANbus protocol to exchange information and control charging using the CHAdeMO protocol	
Typically used variables	Description
Enabled	CHAdeMO controller enabled
Active	Connected
Complete	Protocol session ended normally
Tripped	CHAdeMO protocol terminated abnormally
Problem	CHAdeMO controller fault
SelftestActive(Set)	Start self-test
SelftestActive	Self-test running

### 3.1.5. ClockCtrlr

Description		
Provides a means to configure management of time tracking by Charging Station.		
Variables	Type	Description
DateTime	dateTime	Contains the current date and time.
NtpServerUri	string	This contains the address of the NTP server. Multiple NTP servers can be configured as backups, etc. If the NTP client supports it, it can also connect to multiple NTP servers simultaneous to get a more reliable time source. Variable instance value is single digit NTP priority (1=highest).
NtpSource	string	When an NTP client is implemented, this variable can be used to configure the client: Use the NTP server provided via DHCP, or use the manually configured NTP server.
TimeOffset	string	Configured local time offset in the format: "+01:00", "-02:00" etc.
NextTimeOffsetTransitionDateT ime	dateTime	Date time of the next time offset transition.
TimeSource	string	Via this variable, the Charging Station provides the CSMS with the option to configure a clock source, if more than 1 are implemented.
TimeZone	string	Configured current local time zone in the format: "Europe/Oslo", "Asia/Singapore" etc.
TimeAdjustmentReportingThres hold	integer	If set, then time adjustments with an absolute value in seconds larger than this need to be reported as a security event <code>SettingSystemTime</code> .

### 3.1.6. DeviceDataCtrlr

Description		
Logical Component responsible for configuration relating to the exchange and storage of Charging Station Device Model data.		
Variables	Type	Description
BytesPerMessage	integer	Message Size (in bytes) - maxLimit used to report constraint on message size. Which message is specified in the instance.
ItemsPerMessage	integer	Maximum number of entries that can be sent in one message. Which entries in which message is specified in the instance.



Description		
ValueSize	integer	Can be used to limit the following fields: SetVariableData.attributeValue, GetVariableResult.attributeValue, VariableAttribute.value, VariableCharacteristics.valueList and EventData.actualValue.

### 3.1.7. DisplayMessageCtrlr

Description		
Logical Component responsible for configuration relating to the display of messages to Charging Station users.		
Variables	Type	Description
Enabled	boolean	Whether Display Message is enabled.
Available	boolean	Whether Display Message is supported.
DisplayMessages	integer	Amount of different messages that are currently configured in this Charging Station, via SetDisplayMessageRequest.
PersonalMessageSize	integer	Max size (in characters) of the personal message element of the IdTokenInfo data (0 specifies no personal data may be stored).
SupportedFormats	MemberList	List of message formats supported by this Charging Station. Possible values: See MessageFormatEnumType.

### 3.1.8. ISO15118Ctrlr

Description	
Communicates with an EV to exchange information and control charging using the ISO 15118 protocol.	
Typically used variables	Description
Enabled	
Active	Connected
Tripped	ISO15118 communication session aborted
Complete	ISO15118 communication session ended
Problem	ISO15118 controller fault
SelftestActive(Set)	Start self-test
SelftestActive	Self-test running
ContractValidationOffline	Supports validation of a contract certificate when offline
CentralContractValidationAllowed	Contract certificates can be validated by the CSMS

### 3.1.9. LocalAuthListCtrlr

Description		
Logical Component responsible for configuration relating to the use of Local Authorization Lists for Charging Station use.		
Variables	Type	Description
Enabled	boolean	Whether Local Authorization List is enabled.
Entries	integer	Amount of IdTokens currently in the Local Authorization List. The maxLimit of this variable SHALL be provided to report the maximum number of IdTokens that can be stored in the Local Authorization List.
Available	boolean	Whether Local Authorization List is supported.
ItemsPerMessage	integer	Maximum number of identifications that can be sent in a single SendLocalListRequest.
BytesPerMessage	integer	Message Size (in bytes) - puts a constraint on SendLocalListRequest message size.
Storage	integer	Indicates the number of bytes currently used by the Local Authorization List. MaxLimit indicates the maximum number of bytes that can be used by the Local Authorization List.

### 3.1.10. MonitoringCtrlr

Description		
Logical Component responsible for configuration relating to the exchange of monitoring event data.		
Variables	Type	Description
Enabled	boolean	Whether Monitoring is enabled.
Available	boolean	Whether Monitoring is supported.
ItemsPerMessage	integer	Maximum number of items.
BytesPerMessage	integer	Message Size (in bytes) - puts constraint on message size.
OfflineQueuingSeverity	integer	When set and the Charging Station is offline, the Charging Station shall queue any notifyEventRequest messages triggered by a monitor with a severity number equal to or lower than the severity configured here. Value ranging from 0 (Emergency) to 9 (Debug).

### 3.1.11. OCPPCommCtrlr

Description		
Logical Component responsible for configuration relating to information exchange between Charging Station and CSMS.		
Variables	Type	Description
ActiveNetworkProfile	string	Indicates the configuration profile the station uses at that moment to connect to the network.
FileTransferProtocols	MemberList	List of supported file transfer protocols.
HeartbeatInterval	integer	Interval in seconds of inactivity (no OCPP exchanges) with CSMS after which the Charging Station should send HeartbeatRequest.
NetworkConfigurationPriority	string	A comma separated ordered list of the priority of the possible Network Connection Profiles. Multiple NTP servers can be configured as backups, etc. If the NTP client supports it, it can also connect to multiple NTP servers simultaneous to get a more reliable time source. Variable instance value is single digit NTP priority (1=highest).
NetworkProfileConnectionAttempts	integer	Specifies the number of connection attempts the Charging Station executes before switching to a different profile.
OfflineThreshold	integer	When the offline period in seconds of a Charging Station exceeds the OfflineThreshold it is recommended to send a StatusNotificationRequest for all its Connectors.
QueueAllMessages	boolean	When this variable is set to true, the Charging Station will queue all message until they are delivered to the CSMS.
MessageAttempts	integer	How often the Charging Station should try to submit a TransactionEventRequest message when the CSMS fails to process it.
MessageAttemptInterval	integer	How long in seconds the Charging Station should wait before resubmitting a TransactionEventRequest message that the CSMS failed to process.
UnlockOnEVSideDisconnect	boolean	When set to true, the Charging Station will unlock the cable on Charging Station side when the cable is unplugged at the EV.
WebSocketPingInterval	integer	Number of seconds between pings.
RetryBackOffRepeatTimes	integer	When the Charging Station is reconnecting, after a connection loss, it will use this variable for the amount of times it will double the previous back-off time.
RetryBackOffRandomRange	integer	When the Charging Station is reconnecting, after a connection loss, it will use this variable as the maximum value for the random part of the back-off time.
RetryBackOffWaitMinimum	integer	When the Charging Station is reconnecting, after a connection loss, it will use this variable as the minimum back-off time, the first time it tries to reconnect.

### 3.1.12. ReservationCtrlr

Description		
Logical Component responsible for configuration relating to reservations.		
Variables	Type	Description
Enabled	boolean	Whether Reservation is enabled.

Description		
Available	boolean	Whether Reservation is supported.
NonEvseSpecific	boolean	If this configuration variable is present and set to true: Charging Station supports Reservation without specifying an EVSE.

### 3.1.13. SampledDataCtrlr

Description		
Logical Component responsible for configuration relating to the reporting of sampled meter data.		
Variables	Type	Description
Enabled	boolean	If this variable reports a value of true, Sampled Data is enabled.
Available	boolean	If this variable reports a value of true, Sampled Data is supported.
SignReadings	boolean	If set to true, the Charging Station includes signed meter values in the MeterValuesRequest to the CSMS.
TxEndedMeasurands	MemberList	Sampled measurands to be included in the meterValues element of TransactionEventRequest (eventType = Ended), every TxEndedSampleInterval seconds from the start of the transaction.
TxEndedInterval	integer	Interval in seconds between sampling of metering (or other) data, intended to be transmitted in the TransactionEventRequest (eventType = Ended) message.
TxStartedMeasurands	MemberList	Sampled measurand(s) to be taken at the start of any transaction to be included in the meterValues field of the first TransactionEventRequest message send at the start of a transaction (eventType = Started).
TxUpdatedMeasurands	MemberList	Sampled measurands to be included in the meterValues element of every TransactionEventRequest (eventType = Updated), every SampledDataTxUpdatedInterval seconds from the start of the transaction.
TxUpdatedInterval	integer	Interval in seconds between sampling of metering (or other) data, intended to be transmitted via TransactionEventRequest (eventType = Updated) messages.

### 3.1.14. SecurityCtrlr

Description		
Logical Component responsible for configuration relating to security of communications between Charging Station and CSMS.		
Variables	Type	Description
BasicAuthPassword	string	Hexadecimal representation of the password that the Charging Station uses to authenticate itself if HTTP Basic authentication is used (20 bytes maximum, represented as a string of up to 40 hexadecimal digits). If certificates are used, this option does not have to be present.
Identity	string	The Charging Station identity. identity is an identifying string, so it SHALL only contain characters that are allowed for identifierString. Maximum length was chosen to ensure compatibility with EVSE ID from [EMI3] "Part 2: business objects".
OrganizationName	string	Organization name that is to be used for checking a security certificate.

### 3.1.15. SmartChargingCtrlr

Description		
Logical Component responsible for configuration relating to smart charging.		
Variables	Type	Description
Enabled	boolean	Whether Smart Charging is enabled.
Available	boolean	Whether Smart Charging is supported.
ACPhaseSwitchingSupported	boolean	If defined and true, this EVSE supports the selection of which phase to use for 1 phase AC charging.
ProfileStackLevel	integer	Max StackLevel of a ChargingProfile. The number defined also indicates the max allowed number of installed charging schedules per Charging Profile Purposes.
RateUnit	MemberList	A list of supported quantities for use in a ChargingSchedule. Allowed values: 'A' and 'W'.

Description		
PeriodsPerSchedule	integer	Maximum number of periods that may be defined per ChargingSchedule.
ExternalControlSignalsEnabled	boolean	Indicates whether a Charging Station should respond to external control signals that influence charging.
NotifyChargingLimitWithSchedules	boolean	Indicates if the Charging Station should include the externally set charging limit/schedule in the message when it sends a NotifyChargingLimitRequest message. This might increase the data usage significantly, especially when an external system sends new profiles/limits with a short interval. Default is false when omitted.
Phases3to1	boolean	If defined and true, this Charging Station supports switching from 3 to 1 phase during a transaction.
Entries	integer	Amount of Charging profiles currently installed on the Charging Station. MaxLimit used to limit number of Charging profiles installed at any time.
LimitChangeSignificance	integer	If at the Charging Station side a change in the limit in a ChargingProfile is lower than this percentage, the Charging Station MAY skip sending a NotifyChargingLimitRequest or a TransactionEventRequest message to the CSMS. It is RECOMMENDED to set this key to a low value. See Smart Charging signals to a Charging Station from multiple actors.

### 3.1.16. TariffCostCtrlr

Description		
Logical Component responsible for configuration relating to tariff and cost display.		
Variables	Type	Description
Enabled	boolean	Whether Tariff/cost is enabled.
Available	boolean	Whether Tariff/cost is supported.
TariffFallbackMessage	string	Message (and/or tariff information) to be shown to an EV Driver when there is no driver specific tariff information available.
TotalCostFallbackMessage	string	Message to be shown to an EV Driver when the Charging Station cannot retrieve the cost for a transaction at the end of the transaction.
Currency	string	Currency used by this Charging Station in a ISO 4217 formatted currency code.

### 3.1.17. TxCtrlr

Description		
Logical Component responsible for configuration relating to transaction characteristics and behaviour.		
Variables	Type	Description
EVConnectionTimeOut	integer	Interval in seconds from between "starting" of a transaction until incipient transaction is automatically canceled, due to failure of EV driver to (correctly) insert the charging cable connector(s) into the appropriate socket(s). The Charging Station SHALL go back to the original state, probably: 'Available'. "Starting" might be the swiping of the RFID, pressing a start button, a RequestStartTransactionRequest being received etc.
TxBeforeAcceptedEnabled	boolean	With this configuration variable the Charging Station can be configured to allow charging before having received a BootNotificationResponse with RegistrationStatus: Accepted. See: Transactions before being accepted by a CSMS.
TxStartPoint	MemberList	Defines when the Charging Station starts a new transaction: first transactioneventRequest: eventType = Started. When any event in the given list occurs, the Charging Station SHALL start a transaction The Charging Station SHALL only send the Started event once for every transaction. It is advised to put all events that should be part of a transaction in the list, in case the start event never occurs. Because the possible events don't always have to come in the same order it is possible to provide a list of events. Which ever comes first will then cause a transaction to be started. For example: EVConnected, Authorized would mean that a transaction is started when an EV is detected (Cable is connected), or when an EV Driver swipes his RFID card en the CSMS successfully authorizes the ID for charging.

Description		
TxStopPoint	MemberList	Defines when the Charging Station ends a transaction: last transactioneventRequest: eventType = Ended. When any event in the given list is no longer valid, the Charging Station SHALL end the transaction. The Charging Station SHALL only send the Ended event once for every transaction.
MaxEnergyOnInvalidId	integer	Maximum amount of energy in Wh delivered when an identifier is deauthorized by the CSMS after start of a transaction.
StopTxOnInvalidId	boolean	whether the Charging Station will stop an ongoing transaction when it receives a non- Accepted authorization status in TransactionEventResponse for this transaction.
StopTxOnEVSideDisconnect	boolean	When set to true, the Charging Station SHALL administratively stop the transaction when the cable is unplugged from the EV.

## 3.2. Physical Components

This is a non-exhaustive list of Standardized Physical Components that SHALL be used when mapping a real Charging Station to the Device Model (for monitoring purposes).

When the physical component that is to be mapped, matches the *description* of one of the Standardized Components in this section, for interoperability reasons, the Standardized Component from this section SHALL be used, instead of adding a new (proprietary) component.

The list of typically used variables that is given for each Component is also non-exhaustive and all variables are optional. See also Part 1, paragraph 4.5. If a description of a variable is empty, please refer to the description in [Standardized Variables](#).

### 3.2.1. AccessBarrier

Description	
Allows physical access of vehicles to a charging site to be controlled.	
Typically used variables	Description
Enabled	
Active	Open
Problem	

### 3.2.2. AcDcConverter

Description	
Provides a variable DC current source to force energy directly into an EV battery stack, under tight control of the EV's battery management system.	
Typically used variables	Description
Enabled	(not commanded Out of Service)
Problem	some problem/fault exists
Tripped	A problem requiring intervention has occurred
Overload	Excessive current/power consumption
DCVoltage	measured DC voltage
DCCurrent	measured DC current
Power	measured power
Temperature	temperature of converter
FanSpeed	Speed of cooling fan(s)

### 3.2.3. AcPhaseSelector

Description	
Allows a specific AC phase to be selected (typically at EVSE tier) for single phase vehicle charging in order to lower overall (e.g. site) phase imbalance.	
Typically used variables	Description

Description	
Enabled	
Active	Changing
Problem	
PhaseRotation	

### 3.2.4. Actuator

Description	
A general purpose electro-mechanical output system, with optional completion tracking sensing. Each output should use a Variable instance key indicating the nature of the output.	
Typically used variables	Description
Enabled	
Active	Non-Default
Problem	
State	

### 3.2.5. AirCoolingSystem

Description	
Fans (or equivalent devices) used to provide cooling.	
Typically used variables	Description
Enabled	Cooling system enabled to run
Active	Cooling
Problem	fault: e.g. fan stalled/slow
FanSpeed	Speed of cooling fan(s)

### 3.2.6. AreaVentilation

Description	
Fans (or equivalent devices) used to ensure that EVs that require ventilation during charging	
Typically used variables	Description
Enabled	Area ventilation enabled
Active	Ventilating
Problem	fault: e.g. fan stalled/slow
FanSpeed	Speed of cooling fan(s)

### 3.2.7. BayOccupancySensor

Description	
Sensor (optical, ground loop, ultrasonic, etc.) to detect whether the associated parking/charging bay is physically vacant, or is occupied by a vehicle or other obstruction	
Typically used variables	Description
Enabled	Sensor is sensing for occupancy
Active	Occupied
Percent	percentage obstruction (for analogue sensors).

### 3.2.8. BeaconLighting

Description	
Beacon Lighting to help EV drivers to locate nearby charging places, and/or to determine charging availability state, usually by color variation.	
Typically used variables	Description
Enabled	Beacon Lighting operational
Enabled(Set)=0	Disable beacon lighting
Active	On
Problem	Beacon lighting fault
Percent	Lighting Level (% of maximum)
Percent(Set)=x%	Lighting Level (% of maximum)
Power	Lighting Wattage
Color	Displayed color/intensity

### 3.2.9. CableBreakawaySensor

Description	
A sensor that detects when a charging cable (captive or removable) has been forcibly pulled from the Charging Station.	
Typically used variables	Description
Enabled	Breakaway sensor operational
Active	Tripped
Tripped	Breakaway detected: manual check/fix required

### 3.2.10. CaseAccessSensor

Description	
Reports when an access door/panel is open	
Typically used variables	Description
Enabled	Access sensor is enabled to detect/report opening/closing of access door/panel
Enabled(Set)=0	Disable reporting of access
Active	Open
Tripped	An access door/panel that needs manual reset action has been activated
Problem	A fault exists in the Sensor mechanism itself

### 3.2.11. ChargingStation

Description	
The entire Charging Station as a logical entity	
Typically used variables	Description
Enabled	Available for use (not commanded Out of Service)
Problem	Some problem/fault exists
Identity	Charging Station identity
Tripped	A problem requiring local/manual intervention has occurred.
Overload	Excessive current/power consumption
SupplyPhases	Number of AC supply phases connected
SupplyPhases(MaxLimit)	Number of AC supply phases supported
PhaseRotation	AC wiring phase rotation
ACVoltage	Measured incoming AC voltage [per phase]
ACVoltage(MaxLimit)	Designed maximum operating AC voltage
ACCurrent	Measured total AC current [per phase]
Power	Measured/calculated total power being consumed, including standby/ancillary loads
Power(MaxLimit)	Designed total operating load power, including standby/ancillary loads

Description	
VoltageImbalance	voltage imbalance in three phase supply
CurrentImbalance	current imbalance in three phase supply
VendorName	Charging Station vendor name (as reported in BootNotification)
Model	Charging Station model (as reported in BootNotification)
ECVariant	Engineering Change Variant
SerialNumber	Charging Station serial number
OperatingTimes	recurring operating times
ChargeProtocol	Charging Control Protocol applicable to the Charging Station
AvailabilityState	Indicates if the Charging Station is available or not (replaces the Charging Station Status values reported by the StatusNotification)
AllowNewSessionsPendingFirmwareUpdate	Indicates whether new sessions can be started on EVSEs, while Charging Station is waiting for all EVSEs to become Available in order to start a pending firmware update.

### 3.2.12. ChargingStatusIndicator

Description	
The Charging Status Indicator, provides visible feedback to the user about the connection and charging status of an EVSE/Connector. This is commonly in the form of multi-colored lighting.	
Typically used variables	Description
Active	Lighted
Color	Displayed color

### 3.2.13. Connector

Description	
A means to connect an EV to a Charging Station with either a socket, an attached cable & inline connector, or any wireless power transfer device.	
Typically used variables	Description
Enabled	Connector available for use (not commanded Out of Service)
Problem	problem/fault exists (e.g. over-temperature)
Tripped	A problem requiring intervention has occurred.
ConnectorType	Type of Connector as ConnectorEnumType (e.g. sType2)
SupplyPhases	AC phases connected
SupplyPhases(MaxLimit)	AC phases Max
PhaseRotation	AC wiring phase rotation
ChargeProtocol	Charging Control Protocol applicable to the Connector
AvailabilityState	Indicates if the Connector is available or not (replaces the Status values reported by the StatusNotification)

### 3.2.14. ConnectorHolsterRelease

Description	
A mechanism present in a connector holster to prevent the connector from being removed inappropriately: typically unlocks connector after authorization.	
Typically used variables	Description
Enabled	
Active	Unlocked for removal/return
Problem	
State	



### 3.2.15. ConnectorHolsterSensor

Description	
A mechanism to report when a tethered cable connector has been removed from its normal stowage position. May be used for detection of connectors left un-holstered, and possible penalty billing.	
Typically used variables	Description
Enabled	
Active	Un-Holstered
Problem	

### 3.2.16. ConnectorPlugRetentionLock

Description	
Locking mechanism to retain an inserted plug, both to prevent on-load disconnection, and to prevent theft of charging cables	
Typically used variables	Description
Enabled	Retention mechanism enabled
Active	Locked
Problem	Locking Failed
Tripped	Stall protection fuse blown, etc.
Tries	(Re)tries taken on last attempt
Tries(SetLimit)	Configured auto retry count
Tries(MaxLimit)	Maximum auto retry count

### 3.2.17. ConnectorProtectionRelease

Description	
External protective mechanism (e.g. an external shutter or a connector holster lock mechanism) to prevent contact with conductors that may become "live" under other failure modes	
Typically used variables	Description
Enabled	Protection in effect (locked except when in use)
Active	Unlocked
Problem	Lock/Unlock mechanism fault
Tripped	protective mechanism triggered (fuse)

### 3.2.18. Controller

Description	
An embedded logic controller	
Typically used variables	Description
Active	Running
Problem	Controller fault
Interval[Heartbeat]	Heartbeat interval
Manufacturer	Controller manufacturer name
Model	Controller model number
ECVariant	Engineering Change variant
SerialNumber	Controller hardware serial number
VersionNumber	Hardware version number
VersionDate	Hardware version date
FirmwareVersion	Firmware version number (as reported in BootNotification)
MaxMsgElements	Array of implementation-defined limits to the number of elements of specific type that the Charging Station can accept in one message.

Description	
SelftestActive(Set)	Start self-test
SelftestActive	Self-test running

### 3.2.19. ControlMetering

Description	
Energy, Power, Electricity meter, used to measure energy, current, voltages etc.	
Typically used variables	Description
Power	Measured power
ACCurrent	Measured AC current [per phase]
DCCurrent	Measured DC current
DCVoltage	Measured DC voltage

### 3.2.20. CPPWMController

Description	
Control Pilot PWM Controller: provides and senses the IEC 61851-1 / SAE J1772 low voltage DC and PWM signalling between an EVSE and EV over a control pilot line.	
Typically used variables	Description
Enabled	
Active	Connected
Problem	CP PWM controller fault
DCVoltage	Control Pilot wire DC Voltage (0-12V)
State	IEC 61851-1 states ("A" to "E")
Percentage	1kHz Duty Cycle
SelftestActive(Set)	Start self-test
SelftestActive	Self-test running

### 3.2.21. DataLink

Description	
Provides a communications link from a Charging Station to a CSMS. It may use fixed infrastructure, mobile telephony data services, WiFi, or other connectivity channels.	
Typically used variables	Description
Enabled	Data link enabled
Active	Connected
Fallback	Using Backup SIM/Network Preference
Complete	Link connection terminated
Problem	Communications module or link connection fault
IMSI	International Mobile Subscriber Identity number of mobile data SIM card
ICCID	Integrated Circuit Card Identifier of mobile data SIM card.
NetworkAddress	Current network address
SignalStrength	Data signal strength/quality

### 3.2.22. Display

Description	
Provides information and feedback to the user.	
Typically used variables	Description
Enabled	Display configured to show information

Description	
Problem	Display fault
Color	Display color (monochrome/backlighting)
Count[HeightInChars]	Display height (characters)
Count[WidthInChars]	Display width (characters)
DataText[Visible]	Current Display Contents
State	Alphanumeric code indicating current message purpose

### 3.2.23. DistributionPanel

Description	
Defines the Distribution Panel, with it's fuses and connections to both Charging Stations and other Distribution Panel's.	
Common Variables	Description
InstanceName	Name of the distribution box
Fuse	Fuse (index n) is the fuse for phase Ln in Ampere.
ChargingStation	The Identity of Charging Station (index n) which is connected to this DistributionPanel. Note: this is an indexed list of Charging Station Identities, not to be confused by the Charging Station component.
ChargingStation	List of Charging Stations Identities connected to this LocalController. (not to be confused with the ChargingStation Component)
DistributionPanel	List of Distribution Panels InstanceNames connected to this LocalController. (not to be confused with the DistributionPanel Component) See the LocalController component for an example.

### 3.2.24. ElectricalFeed

Description	
Represents an incoming electrical connection to a Charging Station, that may be a grid/distribution network connection, of a connection to local power generation and/or storage. Each electrical feed can record the electrical and other characteristics of that feed, including power rating, fusing, upstream metering, etc. When a Charging Station has more than one electrical feed, it must represent which feed supplies each EVSE, and which feed supplies the house load of the Charging Station itself. Simple Charging Stations with only a single electrical feed may omit all electrical feed information, in which case it is inferred that all power is supplied from a single feed, and what would otherwise be ElectricalFeed data (Variables) may be reported as being associated with the ChargingStation component.	
Typically used variables	Description
Enabled	
Active	Connected
Problem	
PowerType	
Power	
Energy	
DCVoltage	
SupplyPhases	
PhaseRotation	
ACVoltage	

### 3.2.25. ELVSupply

Description	
Represents the low voltage power supply (typically 12V DC and often other ELV voltages) that provides operating power for controllers, relays, and other electrical components.	
Typically used variables	Description
EnergyImportRegister	Standby/house energy meter register reading

Description	
Power	instantaneous standby power consumption
Power(MaxLimit)	Design maximum standby power consumption
Fallback	Running on backup energy;
Fallback(MaxLimit): =1	has backup
StateOfCharge	backup battery SOC
Time	(estimated) operating time on backup energy

### 3.2.26. EmergencyStopSensor

Description	
An "Emergency Stop" button that should be pressed by the user or other nearby persons if serious faulty behavior is observed (e.g. smoke/flames from EV or Charging Station).	
Typically used variables	Description
Enabled	Emergency Stop action armed
Active	Pressed/Latched
Tripped	Needs manual reset

### 3.2.27. EnvironmentalLighting

Description	
Provides reporting/control of general illumination lighting in use at Charging Station.	
Typically used variables	Description
Enabled	Environmental Lighting operational
Enabled(Set)=0	Disable Environmental lighting
Active	On
Problem	Environmental lighting fault
Percent	Lighting Level (% of maximum)
Percent(Set)=x%	Lighting Level (% of maximum)
Power	Lighting Wattage
Color	Displayed color/intensity

### 3.2.28. EVRetentionLock

Description	
A locking mechanism on the EV side as a safety measure to prevent it being disconnected while high currents are flowing.	
Typically used variables	Description
Enabled	Retention locking detection in effect
Active	Locked to EV
Complete	Has unlocked
Problem	Lock Problem (e.g. failed to lock/unlock)

### 3.2.29. EVSE

Description	
The entire chain of components responsible for transporting energy from the incoming supply to the electric vehicle (or vice versa)	
Typically used variables	Description
Enabled	Ready for use (not commanded Out of Service)
Problem	some problem/fault exists
Tripped	A problem requiring intervention has occurred
Overload	Excessive current/power consumption

Description	
SupplyPhases	AC phases connected
PhaseRotation	AC wiring phase rotation
AllowReset	When true: EVSE can be reset individually
ACVoltage	Measured total AC voltage [per phase]
ACCurrent	Measured total AC current [per phase]
DCVoltage	Measured total DC voltage [per phase]
DCCurrent	Measured total DC current [per phase]
Power	Measured Power
VoltageImbalance	voltage imbalance in three phase supply
CurrentImbalance	current imbalance in three phase supply
ChargeProtocol	Charging Control Protocol applicable to the EVSE
ChargingTime	Total time duration that EV is taking energy from an EVSE. Short pauses in charging (e.g. battery pre-, post-conditioning) are included
PostChargingTime	Total time since EV has taken energy from EVSE
Count[ChargingProfiles]	Charging Profiles present
Count[ChargingProfiles](MaxLimit)	Maximum Charging Profiles supported
AvailabilityState	Indicates if the EVSE is available or not (replaces the EVSE Status values reported by the StatusNotification)

### 3.2.30. ExternalTemperatureSensor

Description	
Reports ambient air temperature	
Typically used variables	Description
Active	Temperature above MaxSet or MinSet
Problem	Temperature sensor fault
Temperature	Ambient temperature

### 3.2.31. FiscalMetering

Description	
Provides energy transfer readings that are the basis for billing.	
Typically used variables	Description
Problem	Metering Fault (e.g. read error)
EnergyImport	Energy transferred to EV during session
EnergyImportRegister	Cumulative import reading
EnergyExport	Energy transferred from EV during session
EnergyExportRegister	Cumulative export reading
Manufacturer[Meter]	Meter manufacturer name
Manufacturer[CT]	Current transformer manufacturer name
Model[Meter]	Meter model number
Model[CT]	CT model number
ECVariant	Meter engineering change variant
SerialNumber[Meter]	Meter serial number
SerialNumber[CT]	CT serial number(s)
Certificate	
OptionsSet [MeterValueAlignedData]	Set of measurands to read and report at clock-aligned time intervals while charging.
OptionsSet [TxnStoppedAlignedData]	Set of measurands to be read at clock-aligned time intervals while charging and reported in TransactionStopped

### 3.2.32. FloodSensor

Description	
A sensor reporting whether the Charging Station is experiencing water ingress/pooling.	
Typically used variables	Description
Enabled	Water presence/level sensing in effect
Active	Flooding
Tripped	Water level safety sensor tripped
Height	Absolute water height above reference (ground) level.
Percent	Height as percentage between reference minimum (0%) and maximum allowable (100%). Values below 0% and above 100% are possible.

### 3.2.33. GroundIsolationProtection

Description	
An Isolation Tester as part of their own self-test mechanisms, to confirm the isolation of floating circuitry when no Evs are connected	
Typically used variables	Description
Enabled	Electrical isolation testing enabled
Active	Leakage
Complete	Isolation test completed
Problem	Isolation fault
Impedance	Isolation resistance/impedance

### 3.2.34. Heater

Description	
Heater to ensure reliable operation in cold environments	
Typically used variables	Description
Enabled	Heater hardware operation enabled
Active	Heating
Problem	Heater fault
Tripped	Heater equipment permanent fault
Power	Instantaneous heater power level
Power(MaxLimit)	Maximum heater power
Power(MaxSet)	Configured heater power
Temperature(MinSet)	Cut-in temperature
Temperature(MaxSet)	Cut-out temperature

### 3.2.35. HumiditySensor

Description	
Reports relative air humidity	
Typically used variables	Description
Enabled	
Problem	Humidity sensor fault
Humidity	RH(%)

### 3.2.36. LightSensor

Description	
Reports ambient light levels.	
Typically used variables	Description
Enabled	
Problem	Lighting sensor fault
Light	The ambient light level

### 3.2.37. LiquidCoolingSystem

Description	
A liquid based cooling system, typically used to cool the connector cables of very high power Charging Stations.	
Typically used variables	Description
Enabled	Cooling system enabled to run
Active	Liquid circulating
Problem	
Temperature	

### 3.2.38. LocalAvailabilitySensor

Description	
Accepts local signal inputs controlling whether new Charging Sessions can start and/or whether ongoing sessions should continue. Typically connected to a site/building power supply, to automatically report unavailability when closed.	
Typically used variables	Description
Enabled	Local Availability input sensing in operation
Active	Out of Service
Problem	Local Availability sensing circuit error

### 3.2.39. LocalController

Description	
The entire Local Controller as a logical entity	
Common Variables	Description
Enabled	Available for use (not commanded Out of Service)
Problem	Some problem/fault exists
Identity	Local Controller identity
Tripped	A problem requiring local/manual intervention has occurred.
Manufacturer	Local Controller manufacturer name
Model	Local Controller manufacturer model
ECVariant	Engineering Change Variant
SerialNumber	Local Controller serial number
ChargingStation	List of Charging Stations Identities connected to this LocalController. (not to be confused with the ChargingStation Component)

Description	
DistributionPanel	<p>List of Distribution Panels InstanceNames connected to this LocalController. (not to be confused with the DistributionPanel Component)</p> <p>This can be used to describes the electrical connections in the site controlled by the Local Controller.</p> <p>An example. The incoming fuses are all 120A. Each floor has a set of 80A fuses. On the first floor, there's also a group of Charging Stations that are behind a set of 32A fuses.</p> <p>DistributionPanel.Fuse[1] = 120  DistributionPanel.Fuse[2] = 120  DistributionPanel.Fuse[3] = 120  DistributionPanel.DistributionPanel[0] = "Level-1"  DistributionPanel.DistributionPanel[1] = "Level-2"</p> <p>DistributionPanel["Level-1"].Fuse[1] = 80  DistributionPanel["Level-1"].Fuse[2] = 80  DistributionPanel["Level-1"].Fuse[3] = 80  DistributionPanel["Level-1"].ChargingStation[0] = "NLCP013"  DistributionPanel["Level-1"].ChargingStation[1] = "NLCP014"  DistributionPanel["Level-1"].ChargingStation[2] = "NLCP015"  DistributionPanel["Level-1"].DistributionPanel[0] = "Level-1a"</p> <p>DistributionPanel["Level-1a"].Fuse[1] = 32  DistributionPanel["Level-1a"].Fuse[2] = 32  DistributionPanel["Level-1a"].Fuse[3] = 32  DistributionPanel["Level-1a"].ChargingStation[0] = "NLCP130"  DistributionPanel["Level-1a"].ChargingStation[1] = "NLCP136"  DistributionPanel["Level-1a"].ChargingStation[2] = "NLCP132"</p> <p>DistributionPanel["Level-2"].Fuse[1] = 80  DistributionPanel["Level-2"].Fuse[2] = 80  DistributionPanel["Level-2"].Fuse[3] = 80  DistributionPanel["Level-2"].ChargingStation[0] = "NLCP023"  DistributionPanel["Level-2"].ChargingStation[1] = "NLCP024"</p>

### 3.2.40. LocalEnergyStorage

Description	
Energy storage	
Typically used variables	Description
Capacity	Maximum storage capacity
Identity	Local Energy Storage identity

### 3.2.41. OverCurrentProtection

Description	
Protects equipment by disconnecting the electrical supply when the current drawn (on any phase) exceeds the rated value to a substantial degree.	
Typically used variables	Description
Active	Tripped. Trip when over MaxSet/MaxLimit.
Operated	Breaker opened and auto-reclosed
ACCurrent	Measured total AC current [per phase]

### 3.2.42. OverCurrentProtectionRecloser

Description	
Recloser mechanism of an OverCurrentProtection to perform re-arm retries after a trip, or may be set for remotely controlled re-arming on command.	



Description	
Typically used variables	Description
Enabled	Auto reclosing enabled
Active	Reclosing
Active(Set)	Initiate manual reclose
Complete	Reclose cycle completed
Problem	Recloser Fault
Mode	Reclose Mode (None, Auto, Commanded)
Tries	(Re)tries taken on last attempt
Tries(SetLimit)	Configured auto retry count
Tries(MaxLimit)	Maximum auto retry count

### 3.2.43. PowerContactor

Description	
Switches on and off the power to the EV after all authorization and safety requirements have been met. May have secondary contacts to report closure state.	
Typically used variables	Description
Active	Closed
Tripped	Mirror contact protection tripped
Problem	Close/Open failed

### 3.2.44. RCD

Description	
A Residual Current Device (US: ground fault breaker) protects human life and/or downstream equipment by quickly detecting abnormal current flows (usually indicative in earth faults) in the Charging Station, cable, or EV during charging.	
Typically used variables	Description
Tripped	Breaker opened (manual reset required)
Operated	Breaker opened and auto-reclosed

### 3.2.45. RCDRecloser

Description	
A motorized recloser mechanism of an RCD that may be configured to perform re-arm retries after a trip, or may be set for remotely controlled re-arming on command.	
Typically used variables	Description
Enabled	Auto reclosing enabled
Active	Reclosing in progress
Active(Set)	Initiate manual reclose
Complete	Reclose cycle completed
Problem	Recloser Fault
Tries	(Re)tries taken on last attempt
Tries(SetLimit)	Configured auto (re)try count
Tries(MaxLimit)	Maximum auto (re)try count

### 3.2.46. RealTimeClock

Description
Represents realtime clock hardware that can maintain accurate date & time information in a Charging Station, even in the case of simultaneous CSMS uncontactability and power outages or resets.

Description	
Typically used variables	Description
Active	RTC running OK
DCVoltage	Battery voltage
Fallback	Battery failing
Fallback(MaxLimit)	RTC has backup-power. MaxLimit = 1
Problem	RTC fault

### 3.2.47. ShockSensor

Description	
Measures impact forces/accelerations experienced, indicative of possible damage.	
Typically used variables	Description
Enabled	Shock sensing enabled
Active	Shock
Force	detected force (vector)

### 3.2.48. SpacesCountSignage

Description	
Electronic signage allowing a charging controller for a large charging facility to advertise counts of available spaces to passing traffic.	
Typically used variables	Description
Enabled	Spaces count signage enabled
Active	Not Blank
Count	

### 3.2.49. Switch

Description	
A general purpose electromechanical input device, with optional remote defaulting/resetting of values. Each input should use a Variable instance key indicating the nature of the input.	
Typically used variables	Description
Enabled	
Active	Non-Default
State	

### 3.2.50. TemperatureSensor

Description	
Temperature sensor at a point inside the Charging Station; multiple sensing points for a single sensing controller. Multiple sensing points for a single sensing controller may be reported using distinct Variable instance keys.	
Typically used variables	Description
Active	High temperature (over MaxSet)
Problem	Internal temperature sensor fault
Temperature	Enclosure temperature

### 3.2.51. TiltSensor

Description	
Measures Tilt angle from normal reference position (normally 90 degree vertical).	

Description	
Typically used variables	Description
Enabled	Tilt sensing enabled
Active	Tilted
Angle	Measured tilt (vector) from vertical

### 3.2.52. TokenReader

Description	
An authorization token reader (e.g. RFID)	
Typically used variables	Description
Enabled	Token reader enabled
Enabled(Set)=0	Token reader disabled: allow charging without token authentication/authorization
Operated	token data read event
Problem	token reader fault
Token	String read by TokenReader
TokenType	Type of token as IdTokenEnumType

### 3.2.53. UpstreamProtectionTrigger

Description	
Circuitry designed to trigger the disconnection of power to the structure by an upstream protection device after a severe problem has been detected	
Typically used variables	Description
Enabled	Upstream protection enabled
Active(Set)	Force triggering of upstream protection
Tripped	Upstream protection triggered
Problem	Upstream protection fault

### 3.2.54. UIInput

Description	
A logical input mechanism (e.g. set of buttons) that is part of a UI whose use may be communicated to the CSMS (in near real time). May support momentary inputs ("Operated") or modal state ("Active"). Multiple input sources should use explicit Variable instance keys (where the input function is key name).	
Typically used variables	Description
Enabled	UI input enabled
Operated	
Active	

### 3.2.55. VehicleIdSensor

Description	
Reports an identifier associated with a vehicle occupying a charging bay. The identifier may be a vehicle registration number via ANPR hardware, a VIN, or other local identifier of the vehicle based on medium range/active RFID, or any other relevant technology and result.	
Typically used variables	Description
Enabled	VehicleIdSensor enabled
Active	Processing

## Appendix 4. Standardized Variables

This is a non-exhaustive list of Standardized Variables that SHALL be used when the Charging Station and CSMS want to exchange information about a Variable. See also Part 1, paragraph 4.5.

Variables that are specific to a Controller Component are not included in this list, but are part of section 3.1 Controller Components.

Name	Data Type	Unit	Description
ACCurrent	decimal	A	RMS AC Current (in amperes). For 3-phase circuits, each phase (and optional neutral) is represented by a Variable instance equal to a value of the PhaseEnumType (e.g. L1,N). Unkeyed values reported for a Component declared to be multi-phase are assumed to be an average of all per-phase readings, and written values are common per-phase settings. Example(s): ChargingStation: Total AC current consumption (all EVSE's + ancillaries) EVSE: Total current consumed by EVSE: includes losses (AC→DC) and EVSE specific ancillaries (e.g. fans) ElectricalFeed: Inflow AC current on feed
Active	boolean		Component is in its non-resting / active state: e.g. On, Engaged, Locked. Some Components may have secondary functions that have corresponding Active Variables with an explicit Variable instance. Note: Monitoring of changes in the Active state of any Component can be specified by setting Delta monitoring on the boolean value with a delta values of 1. Setting/clearing an Active Variable activates/stops the associated functionality, where remotely controllable. Only components that are Available, and Enabled can be in the Active state.
ACVoltage	decimal	V	RMS AC Voltage (in volts). For 3-phase circuits, each phase (and optional neutral) is represented by a Variable instance equal to a value of the PhaseEnumType (e.g. L1,N). Unkeyed values reported for a Component declared to be multi-phase are assumed to be an average of all per-phase readings, and written values are common per-phase settings. Example(s): ElectricalFeed: Input Voltage
AllowReset	boolean		Component can be reset. Can be used to announce that an EVSE can be reset individually.
Angle	decimal	Deg	Angle(s) relative to normal/design idle position. Multiple Variable instance values may be used to indicate angular position in multiple axes (e.g. Left-Right, Forward-Back).
Attempts	integer		Number of attempts (INCLUDING the original attempt) in the last successful, or attempted, cycle of operation. Applies typically to self-monitoring motorized electro-mechanical equipment, etc. {Null}: Unknown 0: Not Attempted/Not allowed 1: Single attempt/No retries [allowed] 2-N: [up to] N tries [allowed]
AvailabilityState	OptionList		A value of ConnectorStatusEnumType (See part 2): replicates ConnectorStatus values reported in StatusNotification messages.
Available	boolean		The Component exists and is locally configured/wired for use, but might not be (remotely) Enabled.
Certificate	string		Digital Certificate (in Base64 encoding)
ChargeProtocol			The Charging Control Protocol applicable to a Connector. CHAdeMO: CHAdeMO protocol ISO15118: ISO15118 V2G protocol (wired or wireless) as used with CCS CPPWM: IEC61851-1 / SAE J1772 protocol (ELV DC & PWM signalling via Control Pilot wire) Uncontrolled: No charging power management applies (e.g. Schuko socket) Undetermined: Yet to be determined (e.g. before plugged in) Unknown: Not determinable NOTE: ChargeProtocol is distinct from, and orthogonal to, connectorType.

Name	Data Type	Unit	Description
ChargingTime	decimal	s	Time from earliest to latest substantive energy transfer
Color	string		Standard 24 bit hexadecimal RGB values. Reg Green Blue color intensity, expressed as standard 24 bit hexadecimal RGB values: 3 * 00-FF (0-255), in order RRGGBB). E.g. 000000: Black, FF0000: Red, 00FF00: Green, 0000FF: Blue, FFFF00: Yellow, FFFFFFFF: White, 008000: Medium intensity green.
Complete	boolean		Component's operation cycle has completed. Used only in event notifications, where it is always true.
ConnectedTime	decimal	s	Time since logical connection established
ConnectorType	OptionList		A value of ConnectorEnumType (See part 2). Specific type of connector, including sub-variant information. Note: Distinct and orthogonal to Charging Protocol, Power Type, Phases.
Count	integer		General purpose integer count variable for Component state reporting
Currency	string		Currency in a ISO 4217 formatted currency code.
CurrentImbalance	decimal	Percent	Percentage current imbalance in an AC three phase supply.
DataText	string		Text associated with a Component, e.g. a Display.
DateTime	dateTime		Point in time value, in [RFC3339] datetime format. Time zone optional.
DCCurrent	decimal	A	DC Current (in amperes). May be an instantaneous measurement, or a period average, depending on context/equipment.
DCVoltage	decimal	V	DC Voltage (volts). May be an instantaneous measurement, or a period average, depending on context/equipment.
ECVariant	string		Production series variants reflecting internal design changes or sub-component substitutions not affecting external functionality.
Enabled	boolean		The Component is Enabled for operation. For Available components that cannot be selectively (remotely) enabled / disabled, this value is always true. Note: Available cannot be false if Enabled is true, so during inventory reporting, Enabled=1 also logically states Available=true
Energy	decimal	Wh	Energy quantity (in Wh) for reporting/configuring values related to stored energy (i.e. not transferred energy).
EnergyExport	decimal	Wh	Total energy transferred: e.g. from EV during (ongoing or terminated) charging session (in Wh by default)
EnergyExportRegister	decimal	Wh	Cumulative export kWh register value, such as from a (certified) fiscal energy meter.
EnergyImport	decimal	Wh	Total energy transferred.
EnergyImportRegister	decimal	Wh	Cumulative export kWh register value, such as from a (certified) fiscal energy meter.
Entries	integer		General purpose variable for reporting/managing numbers of entries in repetitive data structures. maxLimit characteristic reports maximum possible entries.
Fallback	boolean		Component is operating in a fallback, or backup mode. In inventory reports, a Value of 1 for the maxLimit characteristic indicates that the component can enter a fallback state (i.e. a fallback mode is present).
FanSpeed	decimal	RPM	Fan Speed (in RPM). A value of 0 represents stopped/stalled. An empty value indicates that fan speed cannot be read.
FirmwareVersion	string		Version number of firmware.
Force	decimal	N	Reports (impact) force/ acceleration values (estimates) in one or more directions, in units of Newtons or "g". Multiple force readings in different (orthogonal) dimensions may be reported using Variable instance values, such as Down, Right, Forward.
Formats	MemberList		List of message formats supported by this Charging Station. Possible values: ASCII, HTML, URI, UTF-8.
Frequency	decimal	Hz	Frequency of AC power, signal, or component operation.
FuseRating	decimal	A	Current rating of a fuse/breaker. Variable instances keyed by phase identifier (L1/L2/L3/N).
Height	decimal	m	Height above(+)/below(-) reference level (ground level unless context demands otherwise).

Name	Data Type	Unit	Description
Humidity	decimal	RH	The relative humidity in %.
Hysteresis	decimal	Percent	Specifies the width of a "dead band" (as a percentage of the threshold) around the central value of a threshold setting (e.g. MinSet, MaxSet, monitor thresholds) to avoid repeated triggering when the measured quantity lies close to the threshold and is subject to small variations.
ICCID	string		ICCID (Integrated Circuit Card Identifier) of mobile data SIM card.
Impedance	decimal	Ohm	Impedance: Primary value is real (resistive only) impedance. Where a complex impedance is to be reported, the imaginary part (reactance) must be represented with a separate Variable instance value of "reactance". Reactance values are expressed at the (nominal) relevant operating frequency of the Component (e.g. 50/60Hz for mains electricity feed).
IMSI	string		IMSI (International Mobile Subscriber Identity) number of mobile data SIM card
Interval	integer	s	Minimum Interval (in seconds) between (attempted) operations.
Length	decimal		General Purpose linear distance measure.
Light	decimal	lx	(Ambient) light level. The value is in Lux.
Manufacturer	string		Component Manufacturer name
Message	string		Specific stored message for display.
MinimumStatusDuration	integer	s	Minimum duration that a Charging Station or EVSE status is stable before StatusNotificationRequest is sent to the CSMS.
Mode	string		Operating mode string from among valid options (communicated by OptionList, etc. during capability/configuration discovery).
Model	string		Manufacturer's Model code/number of Component, including suffixes etc. to identify functional, regional or linguistic variation, but NOT engineering change level internal variation not affecting external behaviour, etc.
NetworkAddress	string		Current network address of a Component.
Operated	boolean		The Component operated in an instantaneous, transient, or immediately self-resetting pattern. Used only in event notifications, where it is always true.
OperatingTimes	string		Recurring operating times in iCalendar RRULE format.
Overload	boolean		Component is in Overload state.
Percent	decimal	Percent	Generic dimensionless value reporting/setting value.
PhaseRotation	OptionList		<p>The phase wiring of Component, relative to it's upstream feed Component/device. This variable describes the phase rotation of a Component relative to its parent Component, using a three letter string consisting of the letters: R, S, T and x.</p> <p>The letter 'R' can be identified as phase 1 (L1), 'S' as phase 2 (L2), 'T' as phase 3 (L3).</p> <p>The lower case 'x' is used to designate a phase that is not connected. An empty string means that phase rotation is not applicable or not known.</p>
PostChargingTime	decimal	s	Elapsed time in seconds since last substantive energy transfer
Power	decimal	W,kW	Instantaneous (real) Power (measured/calculated, including power factor for AC). Where a component (e.g. AC to DC Power Converter) has multiple power measurements, the default (unkeyed) instance is "input" power.
Problem	boolean		Component itself has a "Problem" condition that impacts in any significant way on its normal operation. By definition, "Problem" state includes (logical OR) "Fault" state. "Problem" specifically INCLUDES inability to operate that is propagated (up/down/sideways) from any other associated/connected/containing/contained Component.
Protecting	boolean		Applies to "sensor" type Components that have an associated protection capability, whereby they can disconnect power (e.g. using the main PowerContactor) if the sensed quantity is outside preset/configured limits. If Protecting is true, the Component is actively preventing/interrupting charging.

Name	Data Type	Unit	Description
SerialNumber	string		Serial number of Component.
SignalStrength	decimal	dBm	(Radio/Wired/Optical) data signal strength, in ASU (typically 0-31 or 99 for unknown). Or dbmW (typically -140 to -50).
State	string		A state code or name identifier string, to allow the internal state of components to be reported and/or controlled
StateOfCharge	decimal	Percent	Energy Storage Device (e.g. battery) state of charge, expressed as a percentage of nominal design 0-100% operating range. Note: Values below or above 0-100% are possible and represent over discharged/charged states.
Storage	integer	B	In bytes. Amount of storage occupied. Storage(maxLimit) specifies absolute limit Storage(MaxSet) restricts usage to specified Max, if supported.
SupplyPhases	integer		Number of alternating current phases connected/available. 1 or 3 for AC, 0 means DC (no alternating phases). Null value indicates that the number of phases (e.g. in use) is unknown.
Suspending	boolean		If Suspending is true, the Component can is currently suspending charging.
Suspension	boolean		Applies to "sensor" type Components that have a charging suspension capability, typically for safety or equipment protection reasons. If Suspension is true, the component can suspend charging when the sensed quantity is outside preset/configured limits.
Temperature	decimal	Celsius, Fahrenheit	Temperature(s) of component (in Celsius, by default). Components may have multiple indexed temperature sensors.
Time	dateTime		Point in time value, in ISO 8601 datetime format. Time zone optional.
TimeOffset	string		A Time Offset with respect to Coordinated Universal Time (aka UTC or Greenwich Mean Time) in the form of an [RFC3339] time (zone) offset suffix, including the mandatory "+" or "-" prefix.
Timeout	decimal	s	Generic timeout value for Component operation (in seconds).
Token	string		String of bytes representing an ID token.
TokenType	OptionList		Type of Token. Value is one of IdTokenEnumType.
Tries	integer		Number of attempts done by a Component.
Tripped	boolean		Single-shot device requires explicit intervention to re-prime/activate to normal.
VersionDate	dateTime		[RFC3339]
VersionNumber	string		Version number of hardware
VoltageImbalance	decimal	Percent	Percentage voltage imbalance in three phase supply.

## Appendix 5. Reason Codes

The table below provides a list of standardized reason codes that can be used in the optional StatusInfo element of a response.

For each reason code, some messages that might typically return them are shown. This is not an exhaustive list and only indicative.

StatusInfo is optional. Any implementation should be able to function properly without StatusInfo, because every message has the response code values that are essential to perform the function. The *reasonCode* and *additionalInfo* in StatusInfo are meant to provide more insight on what is happening and maybe allow for some automatic recovery.

### IMPORTANT

The existence of a reason code in this table does not imply a requirement to use it nor does it imply a requirement to any of the mentioned messages.

Reason Code	Description	Typically used for
CSNotAccepted	BootNotification of Charging Station has not (yet) been accepted by CSMS.	RequestStartTransaction, RequestStopTransaction
DuplicateProfile	A charging profile with same <i>stackLevel</i> - <i>chargingProfilePurpose</i> combination already exists on the Charging Station and has an overlapping validity period.	SetChargingProfile
DuplicateRequestId	A <i>requestId</i> is provided, that has already been used for this type of request.	UpdateFirmware, PublishFirmware and requests for reports.
FixedCable	The connector has its own fixed cable that cannot be unlocked.	UnlockConnector
FwUpdateInProgress	Operation is not possible, because a firmware update is in progress.	Reset
InternalError	Operation cannot be completed due to an internal error.	(generic)
InvalidCertificate	Provided certificate is invalid.	CertificateSigned, InstallCertificate
InvalidCSR	Provided CSR is invalid	SignCertificate
InvalidIdToken	Provided <i>idToken</i> is not valid.	RequestStartTransaction
InvalidProfile	Provided <i>chargingProfile</i> contains invalid elements.	SetChargingProfile, RequestStartTransaction
InvalidSchedule	Provided <i>chargingSchedule</i> contains invalid elements.	SetChargingProfile, RequestStartTransaction
InvalidStackLevel	Provided value for <i>stackLevel</i> is invalid.	SetChargingProfile
InvalidURL	Provided URL is invalid.	UpdateFirmware, PublishFirmware
InvalidValue	An invalid value has been provided.	(generic)
MissingParam	A parameter that is required for the request is missing.	(generic)
NoCable	No cable is connected at this time.	UnlockConnector
NoError	No error has occurred, but some extra information is in <i>additionalInfo</i> .	(generic)
NotEnabled	Feature is not enabled.	ClearCache
NotFound	No object(s) found that match a provided ID or criteria.	ClearVariableMonitoring, CustomerInformation, GetChargingProfiles, GetDisplayMessages, GetInstalledCertificateIds, GetReport
OutOfMemory	Operation not possible, because system does not have enough memory.	(generic)
OutOfStorage	Operation not possible, because system does not have enough storage.	(generic)
ReadOnly	Targeted variable is read-only and cannot be set.	SetVariables
TooLargeElement	Provided element is too large to handle.	CertificateSigned, InstallCertificate
TooManyElements	Too many elements have been provided.	SetChargingProfile, SetVariables, SendLocalList



Reason Code	Description	Typically used for
TxInProgress	A transaction is in progress.	ChangeAvailability, Reset, RequestStartTransaction
TxNotFound	There is no such transaction.	RequestStopTransaction, SetChargingProfile
TxStarted	A transaction had already started (e.g. due to cable being plugged in).	RequestStartTransaction
UnknownConnectorId	Connector Id is not known on EVSE	ChangeAvailability, UnlockConnector
UnknownConnectorType	Connector type is not known on EVSE	ReserveNow
UnknownEvse	EVSE is not known on Charging Stations	ChangeAvailability, ReserveNow, RequestStartTransaction
UnknownTxId	Provided <i>transactionId</i> is not known.	RequestStopTransaction
Unspecified	No reason is specified, but some extra information is in <i>additionalInfo</i>	(generic)
UnsupportedParam	A parameter was provided that is not supported.	(generic)
UnsupportedRateUnit	A <i>chargingRateUnit</i> is provided that is not supported.	SetChargingProfile
UnsupportedRequest	This request is not supported.	(generic)
ValueOutOfRange	Provided value is out of range.	SetVariables, SetVariableMonitoring
ValuePositiveOnly	Provided value is not greater than zero.	(generic)
ValueTooHigh	Provided value is too high.	(generic)
ValueTooLow	Provided value is too low.	(generic)
ValueZeroNotAllowed	Provided value cannot be zero.	(generic)
WriteOnly	Targeted variable is write-only and cannot be read.	GetVariables