hypercharger

Load management manual

Hypercharger
HYC50 / HYC150 / HYC200 / HYC300 / HYC400
(50kW – 400kW)
Ultra-fast charging system for electric vehicles

for SW-Versions 2.3.x

This page was intentionally left blank.

Load management manual

Version

Version 2-3 of Load management manual, 28.11.2024

Original English version

Although the contents of this document have been carefully checked for accuracy, errors cannot be completely ruled out. If you discover an error, please inform us via support@hypercharger.it.

Manufacturer

Alpitronic Srl
Via di Mezzo ai Piani, 33
39100 Bolzano (BZ)
ITALY
Tel.: +39 0471 1961 000
Fax: +39 0471 1961 451
Homepage: http://www.alpitronic.it
E-Mail: info@hypercharger.it

Service

Alpitronic Srl
Via di Mezzo ai Piani, 33
39100 Bolzano (BZ)
ITALY
Tel.: +39 0471 1961 000
Fax: +39 0471 1961 451
Homepage: http://www.alpitronic.it
E-Mail: support@hypercharger.it

This manual contains important instructions that must be followed during installation or maintenance of the device. It is imperative to consider the following points:

Notice

Safety instructions:

No specific safety instructions are required.

Updates and revisions:

The information contained in this document is updated regularly and without notice to customers.
To ensure that you have the most up-to-date information, we kindly ask you to register on our Hyperdoc document platform using the link below:

https://account.hypercharger.it/register

Reference to installation and maintenance manual:

Hardware relevant information regarding the Hypercharger is found in the dedicated installation and maintenance manuals available on Hyperdoc.

Content

1. Notes

If reactive power control is enabled (e.g.: via OCPP *VAR* extension, configuration key *TargetCos(Phi)* or via Modbus), all references to active power for connector 0 (entire charging station's power absorption) are to be considered as apparent power, instead of active power, according to the following:

$$S = \sqrt{P^2 + Q^2}$$

where:

- *S* is the apparent power limitation imposed to the charging station (connector 0)
- *Q* is the target reactive power set for connector 0
- *P* is the active power drawn from the grid (connector 0)

This way, effective power absorption (considering both active and reactive power) is taken into account.

2. OCPP Smart Charging

Hypercharger's LoadManagement supports OCPP 1.6 Smart Charging profiles by enabling configuration key *ChargePointMaxProfileEnabled*.
For detailed information about OCPP Smart Charging features, please, refer to the official OCPP 1.6 specification.

The supported charging profiles are:

- *ChargePointMaxProfile*
- *TxDefaultProfile*
- *TxProfile*

The following tables contain implementation details of each Smart Charging key, including required and optional keys and incompatibilities between keys.

2.1. ChargingProfile parameters

Name	Note
chargingProfileId	Required.
transactionId	Required if *chargingProfilePurpose* is *TxProfile*, ignored otherwise.
stackLevel	Required. Valid range: 0 - *chargeProfileMaxStackLevel*.
chargingProfilePurpose	Required. Defines the purpose of the schedule. This can be *ChargePointMaxProfile,TxDefaultProfile or TxProfile.*
chargingProfileKind	Required. It must not be *Relative* if *chargingProfilePurpose* is *ChargePointMaxProfile*.
recurrencyKind	Required if *chargingProfileKind* is *Recurring*, ignored otherwise.
validFrom	Optional. If absent it is set to 00:00 1 Jan 1970. Ignored if *chargingProfilePurpose* is *TxProfile.*
validTo	Optional. If absent it is set to 03:14:07 19 Jan 2038. Ignored if *chargingProfilePurpose* is *TxProfile.*
chargingSchedule	Required. Contains limits for the available power or current over time.

Table 1: ChargingProfile parameters

2.2. ChargingSchedule parameters

Name	Note
duration	Optional. If empty, last period continues indefinitely.
startSchedule	Optional. Only valid if *chargingProfileKind* is *Absolute* and *chargingProfilePurpose* is not *TxProfile*, ignored otherwise. If absent, it is set to the time the charging profile is received.
chargingRateUnit	Required. If *VAR*, the request targets reactive profiles (OCPP extension).
minChargingRate	Optional.

Table 2: ChargingSchedule parameters

2.3. ChargingSchedulePeriod parameters

Name	Note
startPeriod	Required.
limit	Required.
numberPhases	Optional, three phase assumed if absent.

Table 3: ChargingSchedulePeriod parameters

2.4. Daylight saving time

Since UTC is not affected by the switch to/from DST, charging profiles should take into account the switch to a different time zone when switching to/from DST. A special, temporary, profile should be provided to ease the transition. This might be especially needed when dealing with recurring schedules.

Following, an example for a daily recurring schedule that correctly handles the transition to DST in Italy (at 02:00 on Sunday, March 28 the clock moved forward by one hour, marking the switch from CET (UTC+1h) to CEST (UTC+2h) timezone). The goal is to have a *TxDefaultProfile* (local time, so CET for winter, CEST for summer):

- 0:00 - 2:00: 0 kW
- 2:00 - 10:00: 150 kW
- 10:00 – 24:00: 5 kW

One could use this profile for wintertime:

chargingProfileId	1		
stackLevel	0		
chargingProfilePurpose	TxDefaultProfile		
chargingProfileKind	Recurring		
recurrencyKind	Daily		
validFrom	2020-10-25T01:00:00Z		
validTo	2021-03-28T01:00:00Z		
chargingSchedule			
	chargingRateUnit	W	
	chargingSchedulePeriod		
		startPeriod	0
		limit	0
		startPeriod	3600
		limit	150000
		startPeriod	32400
		limit	5000

Table 4: Wintertime profile example

And this profile for summertime:

chargingProfileId	3		
stackLevel	2		
chargingProfilePurpose	TxDefaultProfile		
chargingProfileKind	Recurring		
recurrencyKind	Daily		
validFrom	2021-03-29T00:00:00Z		
validTo	2021-10-31T01:00:00Z		
chargingSchedule			
	chargingRateUnit	W	
	chargingSchedulePeriod		
		startPeriod	0
		limit	150000
		startPeriod	28800
		limit	5000
		startPeriod	79200
		limit	0

Table 5: Summertime profile example

As also suggested by OCA, a temporary profile should be provided for the transition between CET and CEST, which keeps into account the fact that that day is longer or shorter than 24 hours, for instance:

chargingProfileId	2		
stackLevel	1		
chargingProfilePurpose	TxDefaultProfile		
chargingProfileKind	Recurring		
recurrencyKind	Daily		
validFrom	2021-03-28T01:00:00Z		
validTo	2021-03-29T00:00:00Z		
chargingSchedule			
	chargingRateUnit	W	
	chargingSchedulePeriod		
		startPeriod	0
		limit	0
		startPeriod	3600
		limit	150000
		startPeriod	28800
		limit	5000

Table 6: Transition profile example

Note that different *stackLevels* are needed since using the same level would overwrite the old profile. Another approach would be having the Central System replacing the old profile exactly at the time zone transition, thus avoiding having multiple profiles with different *stackLevels.*

2.5. OCPP requests

OCPP 1.6 provides three operations initiated by the Central System to interact with a Charge Point's Smart Charging capabilities:

- *SetChargingProfile:* send a charging profile to a Charge Point.
- *ClearChargingProfile:* delete a set of charging profiles from a Charge Point.
- *GetCompositeSchedule:* obtain the composite schedule, as computed by OCPP 1.6 stacking and composition rules.

Moreover, an extension to OCPP capability is provided to control reactive power, via the *chargingRateUnit* key: if "*VAR*" is specified as unit of measure, the profile will be treated as a reactive profile and it will be added to a dedicated profile database, independent of the active profile database.

2.5.1. SetChargingProfile

The Central System can use this operation to add a charging profile to a Charge Point.

Name	Note
connectorId	Required.
csChargingProfiles	Required.

Table 7: SetChargingProfile

The request is accepted if all requirements in 2.5 are respected.

2.5.2. ClearChargingProfile

The Central System can use this operation to remove a set of charging profiles by supplying a number of optional parameters:

Name	Note
id	Optional. *chargingProfileId* of the profile to be cleared. If specified, all the other options are ignored.
connectorId	Optional. If this the only provided option, clear all profiles associated to that *connectorId.*
chargingProfilePurpose	Optional. If this the only provided option, clear all profiles with that *chargingProfilePurpose.*
stackLevel	Optional. If this the only provided option, clear all profiles with that *stackLevel.*
chargingRateUnit	Optional (OCPP extension). If *VAR*, the request targets reactive profiles. If *W*, *A* or absent active profiles are considered.

Table 8: ClearChargingProfile

If more than one option among *connectorId*, *chargingProfilePurpose* and *stackLevel* is specified, the Charge Point will attempt to clear the profiles simultaneously matching all the specified criteria.

For instance, if a request with *chargingProfilePurpose* set to *TxDefaultProfile* and *stackLevel* 1 is sent, the Charge Point will clear only those *TxDefaultProfiles* having *stackLevel* 1 for each and every available connector. The same request can be restricted to a specific connector by providing the option *connectorId* as well as the other two options.

If a request with no option specified is received, all the (active) profiles are cleared.

The request is successful if at least one charging profile is deleted.

2.5.3. GetCompositeSchedule

The Central System can use this operation to get a preview of the upcoming power availability for a certain *connectorId.* The composite schedule is calculated by the Charge Point by using its internal stacking and composition rules, according to OCPP 1.6 specifications.

Name	Note
connectorId	Required.
duration	Required. Length of the requested schedule, starting from the time the request is received.
chargingRateUnit	Optional. If specified, all limits in the composite schedule will be expressed in this unit. 'W' is assumed if not specified. If *VAR*, the request targets reactive profiles (OCPP extension).

Table 9: GetCompositeSchedule

If *connectorId* is 0, the composite schedule is the expected consumption for the entire charger (sum of each connector's power).

2.6. Limitations

2.6.1. chargingProfileId

chargingProfileId -1 is reserved and must not be used.

Additionally, if *ModbusLoadManagementEnabled* is set to *true,* profiles with *chargingProfileId* between -2 and -6 are reserved for the Modbus TCP server, while if Janitza Controller is enabled, *chargingProfileId* -7 should not be used.

2.6.2. minChargingRate

chargingSchedule key *minChargingRate* is unsupported.

3. Modbus TCP server

Hypercharger comes with a Modbus TCP server (slave) that can be enabled to:

- Get information about the charging station and its connectors
- Limit the active power drawn by the grid
- Control the reactive power

The server is active by default and can be disabled by setting *ModbusTcpInterfaceEnabled* to false. Once the server is active, a Modbus client (master) may establish a connection and read the station's input registers.
To enable writing to the station's holding registers – thus controlling active and reactive power absorption – the configuration key *ModbusLoadManagementEnabled* must be set to true. This will, in turn, enable the fallback mechanism (see 3.3 for further details).

Notice

The server's IP address can be configured in the *Network Configuration* section of the web interface. The port is 502.

Endianness is big endian: registers with lower address hold the most significant byte.

Registers are 16 bits wide: data types larger than 2 bytes are stored in two or more registers (e.g.: a UINT32 value is stored in two contiguous 16 bits registers).

Supported Modbus function codes are: 3 (read holding registers), 4 (read input registers) and 16 (write multiple holding registers).

3.1. Input registers

Input registers hold information about the charging station and its connectors. These registers are read-only and can be read with Modbus function code 4 (read input registers).

3.1.1. Charging station (connector 0)

These registers can be read to retrieve information about the whole charging station.

Register	Name	Description	Type	Unit
0	Time	Unix time	UINT32	s
2	NumConnectors	Number of physical connectors: 1..4	UINT16	-
3	StationState	State of the charging station: - 0-Available - 8-Unavailable - 10-Faulted	UINT16	-
4	TotalPowerDrained	Total power drained from the grid by all connectors	UINT32	W
6	SerialNumber	Charging station serial number	Null-terminated 24 char string	-
18	LoadManagementEnabled	Whether external load management controller has control over power to be drained from grid.	UNIT16	bool
30	ChargepointId	OCPP ChargepointId	Null-terminated 32 char string	-
46	MajorVersion	HYC software major version	UINT16	-
47	MinorVersion	HYC software minor version	UINT16	-
48	PatchVersion	HYC software patch version	UINT16	-
49	Current maximum VAR inductive (+)	The currently possible VAR Value inductive (+) in 1 var steps. Example: 15000 var	UINT32	VAR
51	Current maximum VAR capacitive (-)	The currently possible VAR Value capacitive (-) in 1 var steps. Exampl:e -15000 var	UINT32	VAR

Table 10: Charging station input registers

3.1.2. Physical connectors (1..4)

These registers contain information about the state of the physical connectors (ranging from one up to four).
The first digit of the register's address (marked in **bold**) is used to select a specific connector:

- Registers 1xx: connector 1
- Registers 2xx: connector 2
- Registers 3xx: connector 3
- Registers 4xx: connector 4

Register	Name	Description	Type	Unit
100	State	Connector's state: - 0-Available - 1-Preparing_TagId_ Ready - 2-Preparing_EV_ Ready - 3- Charging - 4-SuspendedEV - 5-SuspendedEVSE - 6-Finishing - 7-Reserved - 8-Unavailable - 9-UnavailableFwUpdate - 10-Faulted - 11-UnavailableConnObj	UINT16	-
101	Charging Voltage	Current charging voltage	UINT32	cV
103	Charging Current	Current charging current	UINT16	cA
104	Charging Power	Current charging power	UINT32	W
106	Charge Time	Time from the beginning of the charge	UINT16	s
107	Charged Energy	Charged energy in current session	UINT16	kWh/100
108	SoC	State of Charge in percentage	UINT16	%/100
109	Connector Type	Type of the connector selected - 0-ChargePoint - 1-CCS_DC - 2-CHAdeMO - 3-CCS_AC - 4-GBT	UINT16	-
110	Maximum Charging Power	Maximum charging power determined by EV and Hypercharger (configured Max Grid Power and Connectors power limit)	UINT32	W
112	Minimum Charging Power	Minimum charging power determined by EV and Hypercharger	UINT32	W
114*	Current maximum VAR inductive (+)	The currently possible VAR Value inductive (+) in 1var steps. Example: 15000var	UINT32	VAR
116*	Current maximum VAR capacitive (-)	The currently possible VAR Value capacitive (-) in 1var steps. Example -15000var	UINT32	VAR

118	VID	Vehicle ID 8 Bytes, e.g 00:00:AA:BB:CC:DD:EE:FF 118 -> 00 00 119 -> AA BB 120 -> CC DD 121 -> EE FF	8 bytes	-
122	idTag	idTag as 20 chars string	20 bytes	-
132	Total charged energy	Total charged energy counter	INT64	Wh

Table 11: Connectors input registers

*: new implementations should favor using registers 49 and 51 instead, as registers X14 and X16 contain the same values as registers 49 and 51, respectively.

3.2. Holding registers

Holding registers can be used to set active power limitations and a target reactive power. These registers are read/write and can be read with Modbus function code 3 (read holding registers) and written with Modbus function code 16 (write multiple holding registers).

3.2.1. Active power

Active power limits can be set for:

- Connector 0: this is a global limit and can be used to limit the total power absorption (sum of all physical connectors' powers)
- Connector 1..n: limit the available power for a specific connector

Upon receiving a new power limitation, a charging profile is added to Hypercharger's internal database.

Its *chargingProfilePurpose* is:

- *ChargePointMaxProfile*: for connector 0
- *TxDefaultProfile*: for connector 1..4

while *stackLevel* can be specified with configuration key *LMLocalStackLevel*.

Attention

Note that, OCPP and local (Modbus and Janitza) profiles share the same profiles database: OCPP Smart Charging and local controllers are both regarded as different sources of charging profiles acting on the same profiles database.
This means that both profiles can coexist, but LoadManagement should be carefully configured so as to avoid conflicts between profiles.

Register	Name	Description	Type	Unit
0	ChargingStation Max Power	Active power limit for connector 0 (whole charging station)	UINT32	W
100	Connector Max Power	Active power limit for connector 1..4	UINT32	W

Table 12: Active power holding registers

The first digit of the register's address (marked in **bold**) follows the same conventions as in 3.1.2.

3.2.2. Reactive power

Reactive power can be set for connectors 0..4.

Note that:

- if target reactive power is set for either of the physical connectors (thus, excluding connector 0), the resulting reactive power is computed as the algebraic sum of all the physical connectors' reactive powers (1..4)
- otherwise, the target reactive power is set from the target power for connector 0

It is advisable to only set the target reactive power for connector 0, as setting the power for the other connectors is deprecated and might be removed in a future release.

Register	Name	Description	Type	Unit
2	SetReactivePower	Requested VAR power for connector 0. Inductive = + VAR; Capacitive = - VAR. If the system cannot reach the requested VAR value, it should use the maximum possible VAR value as close as possible to the requested	INT32	VAR
102	SetReactivePower	Requested VAR power. Inductive = + VAR; Capacitive = - VAR. If the system cannot reach the requested VAR value, it should use the maximum possible VAR value as close as possible to the requested	INT32	VAR

Table 13: Reactive power holding registers

The first digit of the register's address (marked in **bold**) follows the same conventions as in 3.1.2.

The station's stacks can deliver up to:

- +14 kVAR (capacitive)
- -15 kVAR (inductive)

The station's stacks can deliver up to:

Power Unit / Stack type	Max. Inductive (+) Reactive Power (VAR)	Max. Capacitive (-) Reactive Power (VAR)
Power Unit 25 kW	+8,200	-8,200
Power Unit 50 kW	+24,000	-24,000
SiC Power-Stack 75 kW	+14,000	-15,000
SiC Power-Stack 100 kW	+48,000	-48,000

Table 14: Maximum Power Unit / SiC Power-Stack Output

3.3. Fallback mechanism

The Modbus server is equipped with a fallback mechanism that kicks in when a connection timeout occurs.
The external Modbus controller (client) is expected to connect to the Modbus RTU server and to read and/or write some registers. If that is not the case for at least *GridFallbackTimeout* seconds, the fallback mechanism takes control and the limit for all connectors (including connector 0) is set to *GridFallbackPower*.
Once in fallback, the client must close the current connection and re-establish a new one before being able to read and/or write registers. Active power registers are cleared (i.e.: set to *MaxGridPower)* once in fallback, so the desired power limitations must be re-sent once a connection has been established.

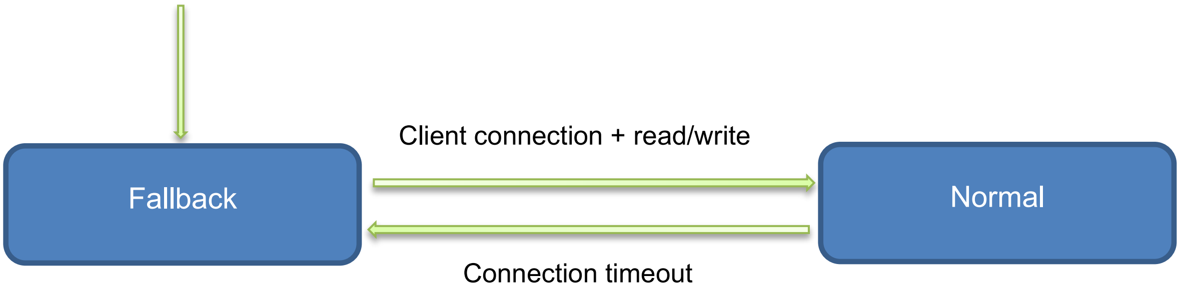

Figure 1: Modbus TCP server fallback mechanism

4. Janitza client

Hypercharger is equipped with a Modbus TCP client (master) that can be enabled to communicate with Janitza's UMG96 meter. One can limit the charging station's power absorption based on two different strategies that can be enabled by setting the *JanitzaMeterConfig* configuration key:

- JanitzaMeterConfig set to 0: Janitza client disabled

- JanitzaMeterConfig set to 1:

$$P_{active} = JanitzaLMPowerLimit - P_{Janitza} - SafetyMargin$$

- JanitzaMeterConfig set to 2:

$$P_{active} = JanitzaLMPowerLimit - P_{Janitza} + P_{station} - SafetyMargin$$

Where:

- P_{active} is the active power limitation imposed to the charging station (connector 0). It is implemented by sending a *ChargePointMaxProfile* with *stackLevel* set to *LMLocalStackLevel*.
- *JanitzaLMPowerLimit* is the configuration key *JanitzaLMPowerLimit*
- $P_{Janitza}$ is the instantaneous active power read by Janitza's UMG96 meter (register 19026)
  - Mode 1: the meter measures an external load (charging station excluded)
  - Mode 2: the meter measures an external load and the charging station
- *SafetyMargin* is the configuration key *JanitzaLMSafetyMargin*
- $P_{station}$ is the total instantaneous active power drawn from the grid by the charging station

One can customize the IP address and port of the meter by setting the configuration keys *JanitzaIP* and *JanitzaPort*, respectively.

Attention

Note that, OCPP and local (Modbus and Janitza) profiles share the same profiles database: OCPP Smart Charging and local controllers are both regarded as different sources of charging profiles acting on the same profiles database.
This means that both profiles can coexist, but LoadManagement should be carefully configured so as to avoid conflicts between profiles.

4.1. Fallback mechanism

The Janitza client is equipped with a fallback mechanism that sets the active power available to a value equal to configuration key *GridFallbackPower* when the communication with the meter is unsuccessful. Normal operation is reinstated when a successful communication has been established.

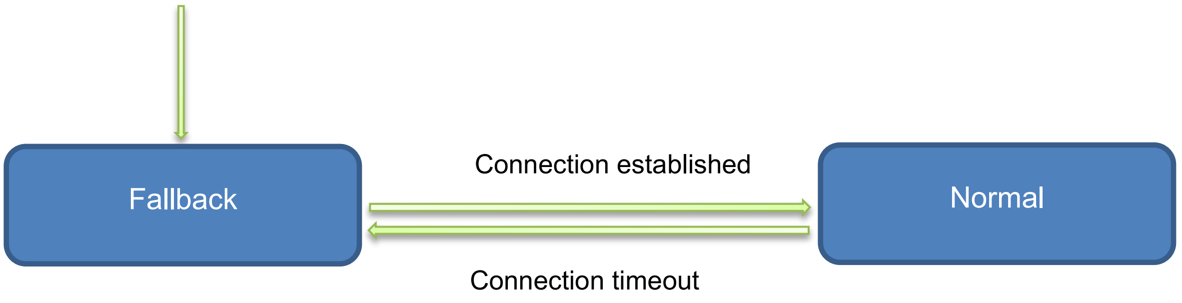

Figure 2: Janitza client fallback mechanism

4.2. Topology examples

The following figures show a schematization of the possible installation options.

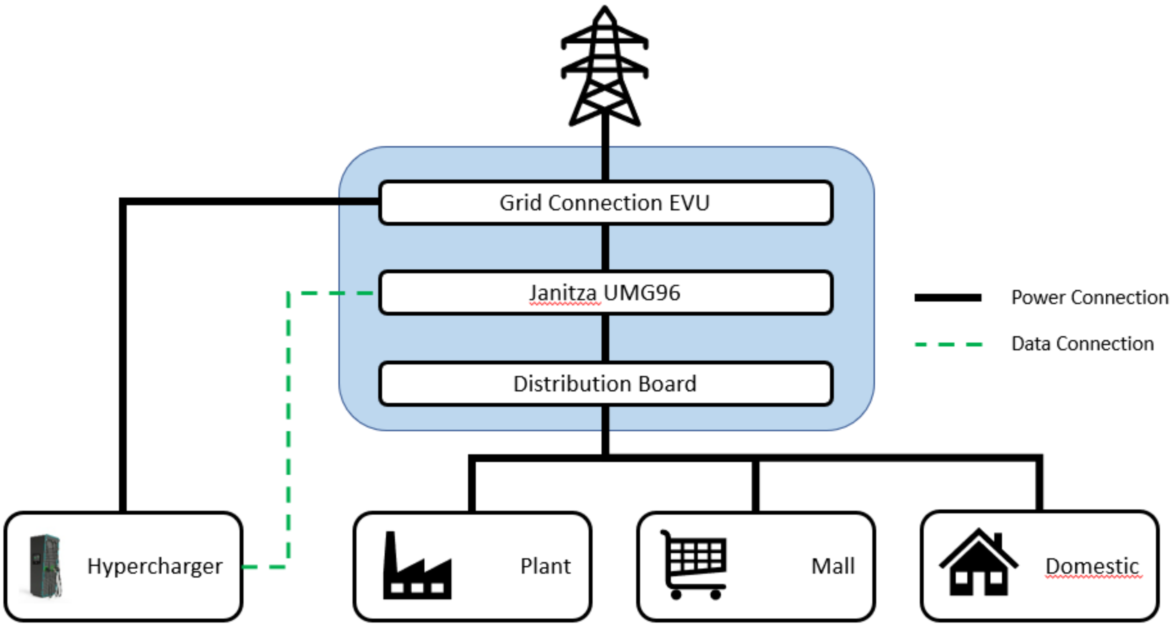

Figure 3: Janitza's UMG96 does not measure the charging station's power consumption (mode 1)

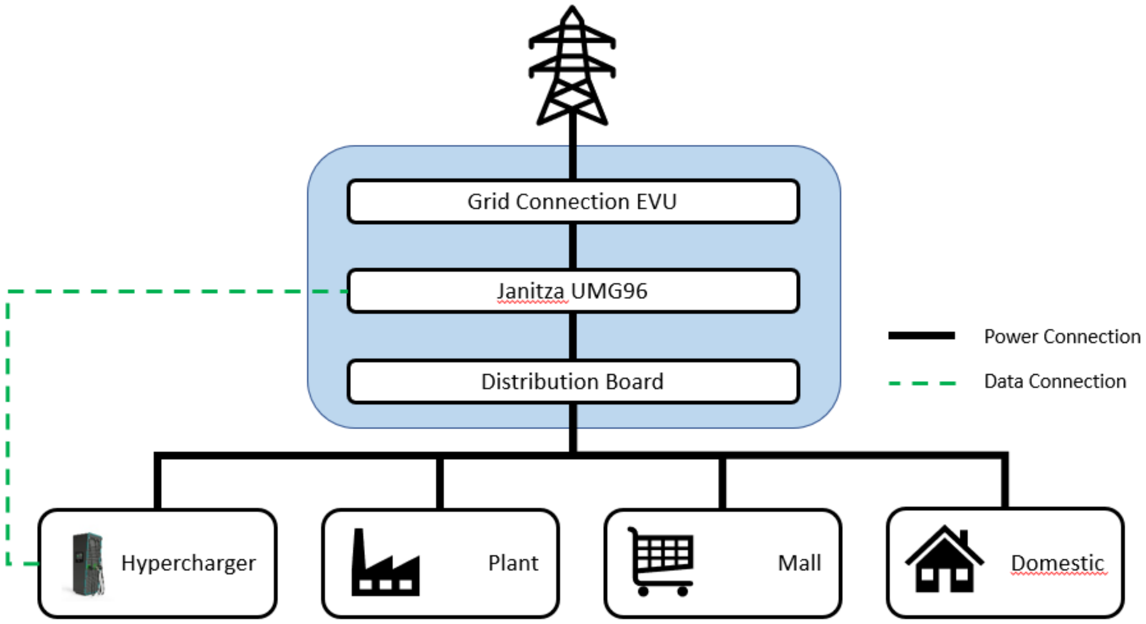

Figure 4: Janitza's UMG96 measures the whole power consumption, including the charging station's (mode 2)

5. Reactive power control

Hypercharger's LoadManagement allows one to control the reactive power for each physical connector via two mutually exclusive options:

- Modbus: refer to 3.2.2
- Configuration key *TargetCos(Phi)*

If the absolute value of *TargetCos(Phi)* is less than 0.99, the reactive power control is enabled and the target reactive power $P_{reactive}$ for each physical connector is computed according to the following formula:

$$P_{reactive} = \sqrt{\left(\frac{P_{active}}{\cos\varphi}\right)^2 - P_{active}{}^2}$$

Where P_{active} is the active power drawn by the connector and $cos(\varphi)$ is the power factor.

Notice

TargetCos(Phi) must be set to 0.99 if the configuration key *ModbusLoadManagementEnabled* is set to *true*.

6. Silent Mode

Silent Mode allows one to limit the sound pressure level produced by the charging station (e.g.: by the fans used for cooling), by effectively reducing the active power drawn from the grid. Aim of this functionality is to ensure that at a certain distance from the charging station, the sound pressure is less than a certain threshold.

Silent Mode can be configured with three parameters:

- Distance: distance at which sound pressure level is computed
- Mode: choose between a set of preconfigured Silent Mode schedules (see Table 15)
- TimeZone: all schedule times are based on the specified time zone (default "Europe/Paris"). Valid values are those accepted by the POSIX TZ environment variable.

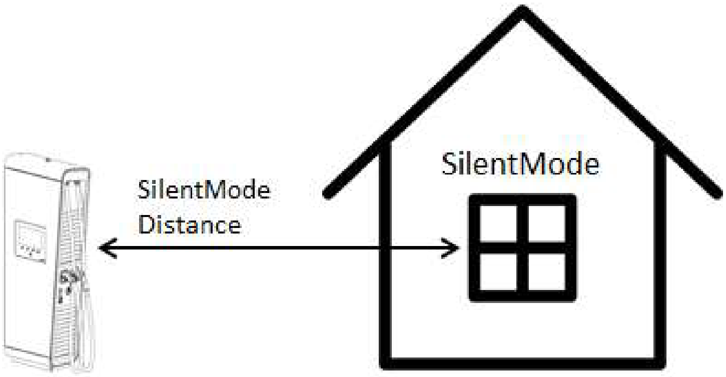

Figure 5: Silent Mode overview.

Mode	Time	SPL [dB(A)]
A	00:00 - 23:59	70
B	06:00 - 21:59	65
	22:00 - 05:59	50
C	06:00 - 21:59	63
	22:00 - 05:59	45
D	06:00 - 21:59	60
	22:00 - 05:59	45
E	06:00 - 21:59	55
	22:00 - 05:59	40
F	06:00 - 21:59	50
	22:00 - 05:59	35
G	06:00 - 21:59	45
	22:00 - 05:59	35
OFF	-	-

Table 15: different schedules available for Silent Mode

Attention

If Silent Mode is enabled, it gets the highest priority over every other active power limit imposed (e.g.: via OCPP or Modbus profiles).

7. Configuration keys

The following table gathers parameters related to the LoadManagement.

Number	Name	Description	Type	Unit
19	***NumberOfConnectors***	Number of installed charging connectors.	UINT32	-
39	***ChargeProfileMaxStackLevel***	Maximum allowed stackLevel for a charging profile.	UINT32	-
40	***ChargingScheduleAllowedChargingRateUnit***	Allowed charging schedule units. (Default: W,A).	CSV	-
41	***ChargingScheduleMaxPeriods***	Maximum number of periods a schedule can have.	UINT32	-
43	***MaxChargingProfilesInstalled***	Maximum number of installed OCPP profiles (local profiles excluded).	UINT32	-
46	***ChargePointSerialNumber***	Charge point serial number.	STRING	-
54	***ChargePointIdentity***	Charge point identity.	STRING	-
77	***MaxGridPower***	Maximum available power from the grid.	UINT32	W
79	***ChargePointMaxProfileEnabled***	Enable OCPP Smart Charging features.	BOOL	-
81	***GridFallbackPower***	If local profiles are enabled and an invalid profile is active, the maximum allowed power for each connector is set to this value.	UINT32	W
82	***GridFallbackTimeout***	Duration of a received local profile.	UINT32	s
84	***ModbusLoadManagementEnabled***	Enable Modbus holding registers writing for load management (also enables fallback mechanism). When true,ModbusTcpInterfaceEnabled must be set to true.	BOOL	-
85	***ChargingStrategy***	Available charging strategies: • FCFS (First Come First Served): prioritize connectors that started charging earlier • FAIR: distribute power equally among connectors	STRING	-
98	***JanitzaMeterConfig***	Janitza mode. 0 (disabled), 1, 2.	UINT32	-
105	***JanitzaLMPowerLimit***	Janitza power limit (see chapter 4 for details).	UINT32	W
106	***JanitzaLMSafetyMargin***	Safety margin for Janitza local controller.	UINT32	-
115	***SilentMode***	Silent Mode: “A”, “B”, “C”, “D”, “E”, “F”, “G”, “OFF”.	STRING	-
116	***SilentModeDistance***	Silent mode distance.	UINT32	m

119	***TargetCos(Phi)***	Desired power factor.	FLOAT	-
141	***TimeZone***	Charging station time zone • "America/Anchorage" • "America/Caracas" • "America/Chicago" • "America/Denver" • "America/Los_Angeles" • "America/New_York" • "America/Sao_Paulo" • "Africa/Cairo" • "Asia/Dhaka" • "Asia/Dubai" • "Asia/Hong_Kong" • "Asia/Karachi" • "Asia/Tokyo" • "Australia/Adelaide" • "Australia/Brisbane" • "Australia/Darwin" • "Australia/Sydney" • "Europe/London" • "Europe/Moscow" • "Europe/Paris" • "Pacific/Honolulu" • "Pacific/Noumea"	STRING	-
142	***LMLocalStackLevel***	Charging profile *stackLevel* for local profiles (Modbus and Janitza).	UINT32	-
143	***JanitzaIP***	IP address of Janita's UMG96 modbus slave.	STRING	-
144	***JanitzaPort***	Janitza's UMG96 modbus port.	UINT32	-
168	***ModbusTcpInterfaceEnabled***	When set to false, disable LoadManagement's Modbus TCP server.	BOOL	-

Table 16: LoadManagement configuration keys

8. List of figures

9. List of tables