

# Configure Advanced Dynamic Load Management

In some installations, there's only a limited amount of supply power available for chargers. For example a 3x35A power supply cannot feed double socket outlet charger, like Chago Pro EVF200 with full charging current (2x 3x32A). Or for example parking area has 50 chargers that need to share 3x800 Amperes but no static current limit is wanted to be configured as it would limit all the chargers to 3x16A. In such cases the maximum charging current for each charging EV can be adjusted with a scheme that ensures that maximum available current is given to EVs being charged in all situations and still not go over the maximum electric supply capacity limit in Amperes (A).

## Introducing Advanced Dynamic Load Management

The Ensto Chago chargers with CC1612 charge controller have Advanced Dynamic Load Management (DLM) since 4.2 firmware version. Please use Advanced DLM instead of the old Peer Group, which will be phased out.

## Terminology

**MAXCUR** = Maximum current not to be exceeded by charging system

**DLM Master** = One CC1612 charge controller is promoted as DLM Master. It knows the MAXCUR. Typically one CC1612 charge controller is selected as DLM Master and DLM Slave at the same time.

**DLM Slave** = Other CC1612 charge controllers are DLM Slaves. They connect to DLM Master.

**DLM Group** = One DLM Master and one or more DLM Slaves form a group under which the MAXCUR is not exceeded.

**OCPP Master** = In double sided chargers with two outlets, the master controller (left hand side controller) is the OCPP Master, it handles the communication towards OCPP back-end and has OCPP Connector Id 1. OCPP Master is independent of the DLM Master.

**OCPP Slave** = In double sided chargers with two outlets, the slave controller (right hand side controller) is the OCPP Slave. It uses OCPP Master to communicate with OCPP back-end and has OCPP Connector Id 2. OCPP Slave is independent of the DLM Slave.

## Operating principle

One DLM Master charger and one or more DLM Slave chargers create a DLM group. The DLM Master of the group knows (is set) the maximum charging current (MAXCUR) that must not be exceeded. DLM Slave obeys and sets charging Amperes to a charging EV as the DLM Master commands it to do. If charging situation changes in any of the DLM Slaves, the the DLM slave communicates the change to the DLM Master that then adjusts a new maximum current (A) to every DLM Slave.

If communication between the DLM Master and the DLM Slaves is lost then both parties adjust to configured minimum current (for example 6A or even pause charging temporarily) to not go over the maximum current (MAXCUR) limit in any situation.

DLM is also phase aware, so three EVs with 16A one phase on-board chargers, each charging from different phases due to phase rotation being applied to the charging infrastructure, only consume 3x16A of the capacity allowing other charging EVs to draw more amps. To get advantage of phase rotation follow these instructions: [Phase Rotation](#)

More Advanced DLM schemes are to be coming later in firmware versions, like VIP user privileges, first-in-first-out and so on.

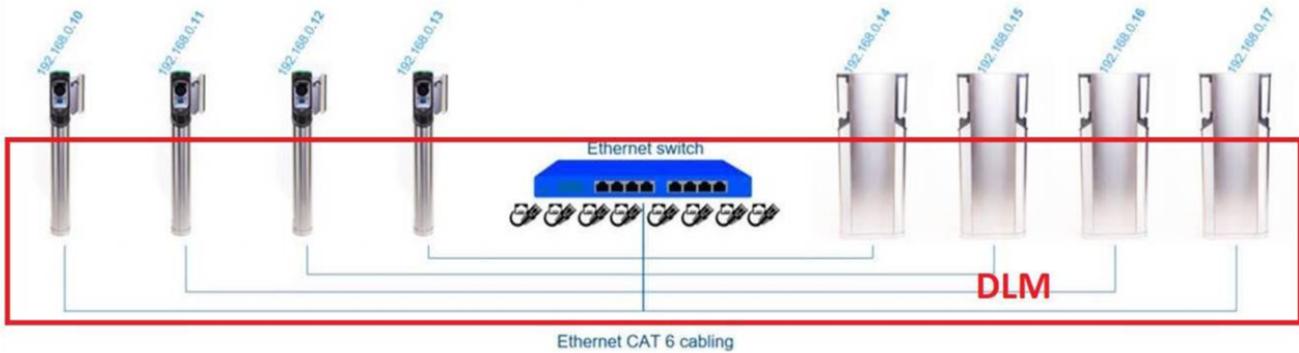
There are 4 different algorithm stages for reaching the DLM goal (to not exceed a certain max overall limit) as follows:

Stage 1 uses HW limits (so no DLM limit at all)  
Stage 2 uses potentially signaled current  
Stage 3 uses actual charging current  
Stage 2 is used if stage 1 is not able to reach the goal  
Stage 3 is used if stage 2 is not able to reach the goal  
And so on...  
Stage 4 uses the minimum current limit

Note: the minimum current limit is a software configuration parameter and this amount of current is guaranteed to be available to the car (from the socket /controller board where this value is set), so same amount of current must be reserved from the main fuse pool, as the load adjustment does not go lower than this value. Therefore 6A (minimum to start charging based on standard 61851) is a good default value.

## Physical connection

DLM Master and DLM Slaves must be accessible to each others in the same IP-network. Connect the chargers to the same Ethernet network, see picture below:



By factory default the chargers are using dynamic IP-addresses (DHCP = the router gives IP-address to the chargers automatically), but if DHCP is not in use then static IP-addresses must be set to the chargers: **Static IP address** . DLM uses IP port 1666.

## Configuration

DLM configuration must be done to both DLM Master and DLM Slave charge controllers separately using the CC1612's web config page.

Selecting DLM Master and DLM Slave roles:

1. Select one charger's OCPP Master controller as DLM Master.
2. All other chargers' OCPP Master and OCPP Slave controllers are DLM Slaves.

Do the below steps in the DLM Master:

1. Login to the Operator page of the Master controller: [Connect laptop to controller](#)
2. Search for *Dynamic Load Management* field and select *DLM Master (With internal DLM-Slave)*.
3. Set maximum input supply electricity current level in field *Overall current limit Phase 1*. Note: unbalanced phase loads are supported so set other phases too. Also be noted that phase rotation is supported so be sure that each chargers supply cable order is as it is set in the field *Phase rotation of the ChargePoint*.
4. Set maximum input supply electricity current level in field *Overall current limit Phase 2*.
5. Set maximum input supply electricity current level in field *Overall current limit Phase 3*.
6. New firmwares has EVSE Sub-Distribution Limit (L1/L2/L3) [A] and Operator EVSE Sub-Distribution Limit (L1/L2/L3) [A] that needs to be set.

Dynamic Load Management	<b>2.</b> DLM Master (With internal DLM-Slave) ▼	Specifies the ChargePoint's role in a DLM network. There MUST be exactly one DLM Master in a DLM network managing multiple DLM-Slaves. Typically, a ChargePoint configured as DLM Master will also host an internal DLM-Slave. Note: A ChargePoint configured as standalone DLM Master will not host an internal DLM-Slave. If used for charging anyway, it's power consumption will be not controlled by DLM!
DLM Network Id	0	Several DLM groupings might coexist in one physical LAN. In case of DLM Master-Auto-Discovery, they are distinguished by Master-Auto-Discovery Network Id
DLM Algorithm	Fair Trade (FIFO) ▼	Dynamic Load Management Algorithm to be used on the DLM Master for load balancing. 'Fair Trade (FIFO)' selects a fair distribution algorithm which works in a first-in-first-out manner. In case there is no energy remaining to distribute, the car has to wait for a free slot.
Overall current limit Phase 1	16 <b>3.</b>	Overall current limit for DLM on Phase 1 in Ampere (A) available for distribution.
Overall current limit Phase 2	16 <b>4.</b>	Overall current limit for DLM on Phase 2 in Ampere (A) available for distribution.
Overall current limit Phase 3	16 <b>5.</b>	Overall current limit for DLM on Phase 3 in Ampere (A) available for distribution.
Minimum current limit	6	Minimum current limit that charging should not go below in Ampere (A).
Disconnected limit	6	Current limit when disconnected from DLM network in Ampere (A).
Charging Log	On ▼	Dynamic Load Management Charging Log stores all relevant charging information in a .csv file

7. Click Save & Restart at the bottom of the page.

Do the below steps in all the DLM Slave(s):

1. Login to the Operator page of the Slave controller: [Connect laptop to controller](#)

2. Search for *Dynamic Load Management* field and select *DLM Slave (Master-Auto-Discovery)*.

Dynamic Load Management	2. DLM Slave (Master-Auto-Discovery) ▼	Specifies the ChargePoint's role in a DLM network. There MUST be exactly one DLM Master in a DLM network managing multiple DLM-Slaves. Typically, a ChargePoint configured as DLM Master will also host an internal DLM-Slave. Note: A ChargePoint configured as standalone DLM Master will not host an internal DLM-Slave. If used for charging anyway, it's power consumption will be not controlled by DLM!
DLM Network Id	0	Several DLM groupings might coexist in one physical LAN. In case of DLM Master-Auto-Discovery, they are distinguished by Master-Auto-Discovery Network Id
Minimum current limit	6	Minimum current limit that charging should not go below in Ampere (A).
Disconnected limit	6	Current limit when disconnected from DLM network in Ampere (A).

3. Click Save & Restart at the bottom of the page.

Note: If you have IT-network (grid without neutral line), then you must select also IT-network on DLM Master starting from 4.63 firmware version.

IT Network	On ▼	Set to 'On', if your power distribution system is IT (isolé-terre). If set to 'On', the DLM Master will only accept DLM Slaves, whose phase rotation is set to 'Single-phase system (IT earthing)'. If set to 'Off', the DLM Master will only accept DLM Slaves, whose phase rotation is not set to 'Single-phase system (IT earthing)'. Connection attempts of DLM Slaves configured differently will be denied.
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Example case:

Dual sided charger with 3\*32A supply cable capacity is divided to each side of the charger:  
firmwares:

New

DLM Master side:  
Master side:

DLM

Overall current limit Phase 1: 32  
Distribution Limit (L1/L2/L3) [A]: 32 for all three phases

EVSE Sub-

Overall current limit Phase 2: 32  
EVSE Sub-Distribution Limit (L1/L2/L3) [A]: 32 for all three phases

Operator

Overall current limit Phase 3: 32  
Current Limit [A]: 16

Minimum

Minimum current limit: 16  
d Limit [A]: 16

Disconnecte

Disconnect limit: 16

DLM Slave

side:

DLM Slave side:  
Current Limit [A]: 16

Minimum

Minimum current limit: 16  
d Limit [A]: 16

Disconnecte

Disconnect limit: 16

Result: We can guarantee that each charger socket can charge 16Amps in case of both sockets are occupied, but if only one side is occupied then that one socket get 32A. Also in case of DLM master-slave communication is disconnected then each side get 16A. 32Amps main fuse never blows. Operator current limit must be set separately to 32Amps in Master side and Slave side too. The charging standard state that minimum current is 8Amps, so that is limiting maximum numbers of the charging points per electricity supply capacity i.e. 80Amps fuse / 8Amps = 10 charging sockets is maximum amount from 80Amps supply.

## Level 2 DLM with external meter

By installing an additional electricity meter (like to the building supply main fuse, or distribution segment transformer, or any unknown load that is part /branch/join of EV charging load) it is possible to adjust charger or charger group total load based on additional electricity meter reading. Set External Meter Support ON in DLM Master configuration parameter:

Dynamic Load Management	DLM Master (With internal DLM-Slave) ▼			Specifies the ChargePoint's role in a DLM network. There MUST be exactly one DLM Master in a DLM network managing multiple DLM-Slaves. Typically, a ChargePoint configured as DLM Master will also host an internal DLM-Slave. Note: A ChargePoint configured as standalone DLM Master will not host an internal DLM-Slave. If used for charging anyway, its power consumption will be not controlled by DLM!
DLM Network Id	0			Several DLM groupings might coexist in one physical LAN. In case of DLM Master-Auto-Discovery, they are distinguished by Master-Auto-Discovery Network Id
DLM Algorithm	Fair Trade (FIFO) ▼			Dynamic Load Management Algorithm to be used on the DLM Master for load balancing; 'Fair Trade (FIFO)' selects a fair distribution algorithm which works in a first-in-first-out manner. In case there is no energy remaining to distribute, the car has to wait for a free slot.
EVSE Sub-Distribution Limit (L1/L2/L3) [A]	16	16	16	Overall current limit for DLM available for distribution to EVs
Operator EVSE Sub-Distribution Limit (L1/L2/L3) [A]	16	16	16	Operator current limit for DLM available for distribution to EVs. The 'Operator EVSE Sub-Distribution Limit' is equal or smaller than the 'EVSE Sub-Distribution Limit'. It can be changed without rebooting the chargepoint. Thus, a backend could use this parameter to alter the energy available for charging EVs dynamically. The backend will not be able to set a value higher than the 'EVSE Sub-Distribution Limit'
External Input 1 Config	DISABLE ▼			Adds a configurable offset to 'EVSE Sub-Distribution Limit' based on GPI External Input 1
External Input 2 Config	DISABLE ▼			Adds a configurable offset to 'EVSE Sub-Distribution Limit' based on GPI External Input 2
External Meter Support	On ▼			If enabled, an external, secondary meter allows to also consider the power consumption of additional load. The power available for charging EVs will be adjusted accordingly. Please make sure, 'Meter configuration (Second)' is configured, preferably to a 3-phase, phase aware meter
Main Distribution Limit (L1/L2/L3) [A]	100	100	100	Current limit for DLM available for distribution to EVs and additional energy loads. This value is typically higher than the 'EVSE Sub-Distribution Limit' above. An external meter is required to detect the energy consumption of the additional load
External Meter Disconnected Fallback (L1/L2/L3) [A]	9999	9999	9999	In the error case, where the external meter is disconnected or fails, 'External Meter Disconnected Fallback' is assumed as external meter value. Set to a high value (like the 'Main Distribution Limit' or higher) will result in no current available for the EVSE sub-distribution in that particular situation. Thus, charging would stop
External Meter Location	Excluding EVSE Sub-Distribution ▼			Specifies, how the external meter is connected: in case the external meter measures the energy of chargepoints and additional consumer altogether, the value shall be set to 'Including EVSE Sub-Distribution', otherwise to 'Excluding EVSE Sub-Distribution'
External Meter Sample Rate	10 min ▼			Rate at which the values of the external meters will be evaluated. The current considered for DLM is the average main distribution current during the last measurement interval.
Minimum Current Limit [A]	6			Minimum current limit that charging should not go below
Disconnected Limit [A]	6			Current limit when disconnected from DLM network

Supported meter types:

- (0)eHZ Meter
- (1)S0 Meter Opto 1
- (2)S0 Meter Opto 2
- (3)No Meter
- (4)S0 Meter Dedicated Input
- (5)Internal Meter
- (6)Modbus Meter ABB
- (7)Modbus Meter Eastron SDM630
- (8)Modbus Eastron SDM120\_220
- (9)Modbus Meter Garo GNM3D
- (10)Modbus Meter Garo GNM1D
- (11)Modbus Meter Garo GM3T
- (12)Modbus Meter Garo EM270
- (13)Modbus Meter Finder
- (14)Modbus Saia ALE3
- (15)Modbus Inepro PRO1\_2
- (16)Modbus Inepro PRO380
- (17)Modbus Optec
- (18)Modbus NZR EcoCount S85
- (19)Modbus B-Control EM300-LR
- (20)Modbus Meter Carlo Gavazzi EM200
- (21)Modbus Meter Carlo Gavazzi EM340
- (22)Modbus Meter Garo GNM3T
- (23)Modbus IME CE4DMID31
- (24)Modbus Siemens 7KT1666
- (25)Modbus B-Control EM300-LR (TCP)
- (26)Modbus Siemens 7KM2200 (TCP)

(27)Modbus Phoenix Contact EEM-MB371 (TCP)

(28)Modbus Schneider iEM3555

Def:No Meter

When chosen eHZ, then meter is connected to EHZ connectors on the controller board.

When chosen Modbus, then meter is connected to RS485A and RS485B connectors on the controller board and Modbus device address of the meter is set as 2 in settings inside of the meter.

When chosen S0, then meter is connected to S0 Data and S0 Power connectors on the controller board.

Starting from firmware version 4.60 also following Modbus over TCP/IP meters are supported:

B-Control EM300-LR (TCP)

Siemens 7KM2200 (TCP)

When chosen TCP/IP -meter, then meter is connected to the Ethernet -connector on the controller board or in bigger installations with Ethernet switch to Local Area Network (LAN).

See connector label markings on the controller printed circuit board.

## Related Articles

- [Configure Advanced Dynamic Load Management](#) (Ensto EV Wiki)
  - [dim](#)
  - [kb-how-to-article](#)