INSTALLATION GUIDE

Terra AC Load Management Installation Guide

Revision C

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1. Introduction

1.1. Preface

This guide describes the physical installation and configuration of the Energy meter from ABB as an example intended for load management of the Terra AC EV Charger.

Before installing the Energy meter, read this Installation Guide carefully and attentively. Follow the instructions in this Installation Guide. Chargedot is not responsible for any damage that has been caused by not or incorrectly following and executing the instructions described in this manual.

1.2. Intended document users

This document is intended to be used by authorized installers who are responsible for the installation of the Terra AC EV Charger and modified the installation to install the load management functionality for the Terra AC EV Charger.

1.3. Signs

The following signs are used on the equipment and in this manual:

	DANGER
	**Hazardous voltage** Identifies a hazard that could result in severe injury or death through electrocution.
	WARNING
	**Various** Identifies a hazard that could result in severe injury or death.
	WARNING
	**Pinch Hazard** Identifies a hazard that could result in injuries in which some body parts are pinched or crushed.
	CAUTION
	**Various** Identifies a hazard that could result in damage to the machine, other equipment, and/or environmental pollution.

CAUTION



Environmental damage
Identifies a special indication as well as biddings and prohibitions to avoid damage to the environment. This sign refers to present national regulation according to the environment.

NOTICE



Contains remarks, suggestions or advice.

1.4. Safety regulations

1.4.1. Manufacturer responsibilities

Our products are manufactured according to the requirements of the various applicable directives. They are therefore delivered with the CE -marking and any necessary documents. In the interest of the quality of our products, we are making continuous improvements. We therefore reserve the right to change the specifications stated in this document.

We as the manufacturer are not responsible in the following cases:

- Failure to follow the instructions for installation and maintenance of the device.
- Failure to follow the instructions for use of the device.
- Defective or insufficient maintenance of the device.

1.4.2. Responsibility from the installer

The installer is responsible for the installation and initial commissioning of the appliance. The installer should observe the following instructions:

- Read and observe the instructions for the device in the manuals supplied.
- Install the device in accordance with applicable legislation and standards.
- Carry out initial commissioning and any necessary checks.
- Explain the installation to the user.
- If maintenance is necessary, warn the user of the inspection and maintenance obligation concerning the device.
- Hand over all manuals to the user.

1.4.3. Electric hazards

	**DANGER** Make sure that the main switch of the power supply group for the product is set to the OFF position, before starting the installation work. Do a voltage check to make sure that the electrical power is disconnected from the system. Secure against resetting.

1.4.4. Installation safety

	**WARNING** **Personal safety (PPE)** Always wear and use the right PPE when it is required for those activities to be carried out on the installation.
	**WARNING** Visually examine the parts that must be installed and the installation for damage. If there is damage, do not install the system.
	**DANGER** **Hazardous voltage** Instructions: 1. Always switch off the external group switch and the main switch in the cabinet, before performing any installation, disassembly, repair or replacement of components. 2. Do a voltage check and make sure that the electrical power is disconnected from the system. 3. Only certified technicians are permitted to carry out the installation work. 4. When the system is in an open or dangerous condition, do not allow unqualified persons to go near it. Instruct and warn people about the potential harmful high voltages. 5. Always connect the Protective Earth (PE) first, before connecting the neutral (N) and Phase (P) wiring. 6. Correctly lock the door after installation or service operations.
	**CAUTION** **Warranty** Installation and commissioning work must be carried out by certified personnel. The warranty will be void if any work is carried out by non-certified personnel.

1.5. Environment and disposal of waste

CAUTION



Always observe the local rules and regulations with respect to processing (non-reusable) parts of the Terra AC EV Charger.

2. Installation

2.1. Modbus connection on Terra AC Charger

NOTICE

Also refer to the Terra AC Installation manual BCM.V3Y01.0.

The Energy meter will be connected to the Terra AC Charger via a Modbus (RS485) cable.

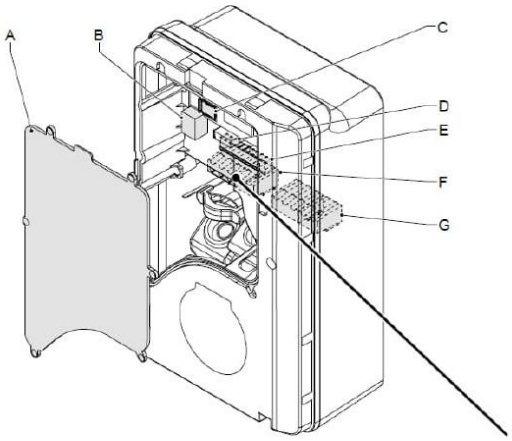
Table below provides general specifications for the required cable. Use these tables to select the cable, taking into consideration local installation conditions, cable length, cable temperature/insulation rating and local regulations.

RS485 cable specifications

Functional description	Specification
Number of cores	2 + common shield
Number of (twisted) pairs	1
Cross section range	0.5 – 2.5 mm^2
Min – Max external diameter to fit through gland	3.5 – 7 mm
Shielding	Yes
Conductor	Fine strand copper wire
Conductor type	Category 5 (Cat 5)
Insulation	PVC or other material that can be used outdoor and are UV-protected
Characteristic impedance	120 Ω
Minimum Test Voltage [AC]	1.5 kV
Ambient Temperature range	-30°C to 70°C
Core identification	Numbering or color

- The cable must have isolation that is self-extinguishing and flame retardant according to DIN VDE 0482-332-1-2, DIN EN 60332-1-2, IEC 60332-1-2.
- The cable must correspond to the VDE, CE and EAC Low Voltage Directive and must meet the RoHS compliance.
- To identify each cable, it is recommended to mark the cables every 2000 mm and at both ends.

Figure below shows the connection to the Terra AC charger with terminal block for Modbus RTU (RS-485).



RS-485 connection for Modbus RTU

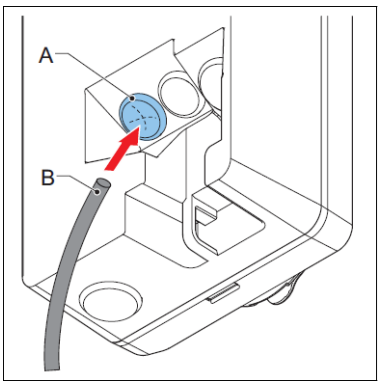
A. Maintenance cover
B. Primary Ethernet connection
C. Socket for Nano–M2M SIM card
D. Smart meter connection
E. Terminal block for dry contacts input and output
F. Terminal block for the AC input
G. Terminal block for the EV charge cable or the socket

A terminal block is present (D) to facilitate the RS-485 – Modbus RTU connection.

2.1.1. Insert the cable for the Energy meter communication

Preconditions:

- Parts: Cable for RS485, 3x ferrules.
- Tools: wire cutter, wire stripper pliers, crimp pliers.

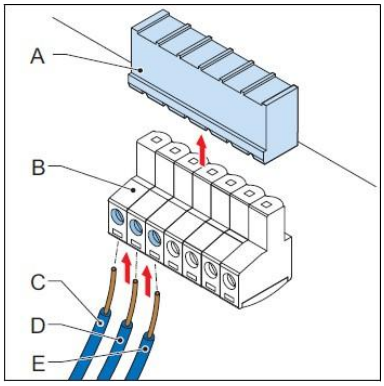


1. Remove the grommet (A) from the Terra AC Charger.
2. Make a hole in the center of the grommet.
3. Install the grommet back on the Terra AC Charger.
4. Cut the cable to the correct length to reach the connector.
5. Push the wires through the grommet.
6. Strip 5 mm of the insulation from the ends of the wires.
7. Crimp a ferrule onto the end of each wire.
8. Put the cable (B) through the inlet hole.

2.1.2. Connect the wires for the Energy meter communication

Preconditions:

- Tools: Slotted screwdriver.



1. Remove the plug (A) of the terminal block (B) from the terminal block (B) of the Energy meter connection.
2. Connect the wires:
   a. Connect the positive wire (C) – RS485 Positive/A/DO.
   b. Connect the negative wire (D) – RS485 Negative/B/DI.
   c. If the Energy meter has a common isolated ground for shielded wire, connect the wire (E).
3. Tighten the connector screws of terminal block (B) with a tightening torque of 0.5 Nm.
4. Install the plug on the terminal block.

2.2. Installation of the Energy meter

DANGER



Make sure that the main switch of the power supply group for the product is set to the OFF position. Do a voltage check to make sure that the electrical power is disconnected from the system. Secure against resetting.

WARNING



The electrical installation must be completed according to the local safety and electrical regulations and laws.

WARNING



The Energy meter must always be protected by fuses on the incoming side. See for more information the installation manuals of the Energy meter.

CAUTION



First read the supplied instructions of the Energy meter and current transformer (if applicable) before starting the installation work.

2.3. Energy meter models

This manual describes the installation of ABB energy meters. Model D11 and D13 are successors of the older B21 and B23 energy meters. Note that other models can be installed as well.



B21



B23

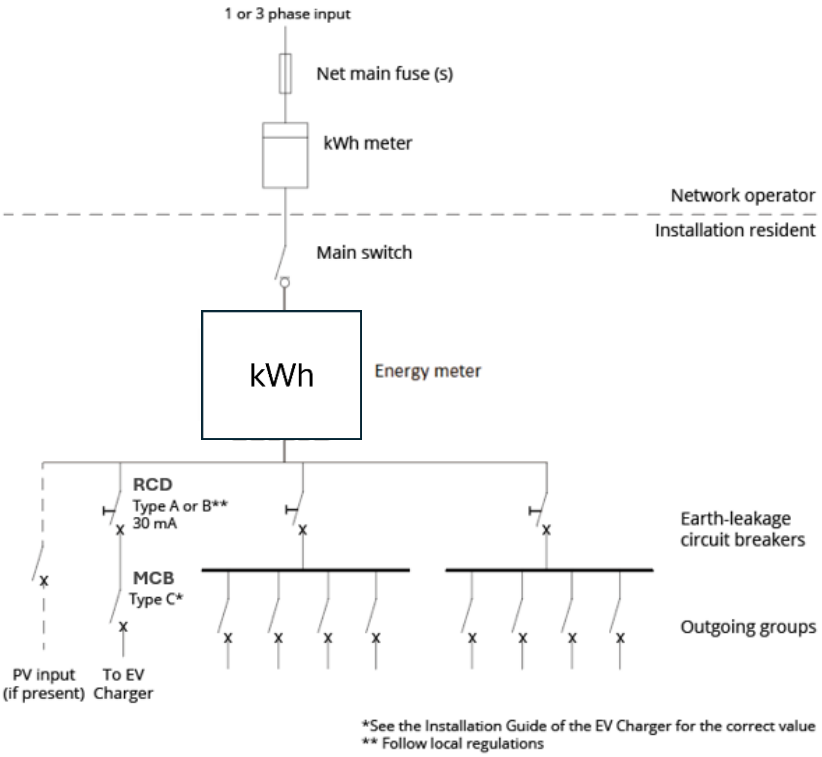


D11



D13

The Energy meter must be installed in the customer's distribution cabinet (Consumer Unit), which is usually located in the hall (electric meter cupboard) of the house. If there is no more room in the distribution cabinet to place the Energy meter, a separate suitable electrical box with DIN rail mounting must be used, which must be placed next to the existing distribution cabinet.
Install the Energy meter after the main switch and before the group distribution protection devices (in most cases the earth leakage circuit breaker(s)). The figure below is an example of a typical residential distribution cabinet.



The main switch is only for safety disconnection during installation. The energy meter can be placed anywhere that measures total household consumption—An isolator must be installed to turn off the power before installing the energy meter.

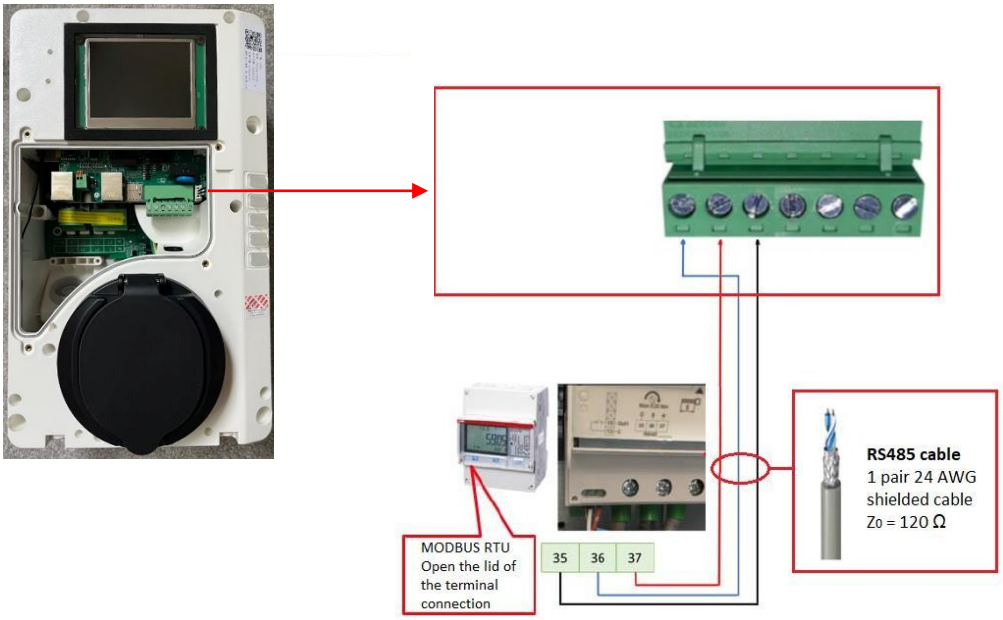
For the mechanical and electrical installation of the Energy meter, use the included installation instructions (can be found within the packaging of the Energy meter) or the User Manuals of the Energy meter you use, which you can find here in the web links below:

Installation instructions for the energy meters can be found in the packaging of the energy meter.

Download links for the energy meter manuals can be found in below table:

ABB Model number	Web link
B21 xx2-xxx	B21_User_Manual.pdf (abb.com)
B23 xx2-xxx	B23_B24_User Manual.pdf (abb.com)
D11 15-M 40 Modbus	D11 15 User Manual (abb.com)
D13 15-M 65 Modbus	D13 15 User Manual (abb.com)

Alternative models	Web link
M1M 15	M1M 15 User manual (abb,com)
M1M 20	M1M 20 User Manual (abb.com)
M1M 30	M1M 30 User Manual (abb.com)
M4M 20	M4M 20 User Manual (abb.com)
M4M 30	M4M 30-32 User Manual (abb.com)
M4M 2X	M4M 2X User Manual (abb.com)



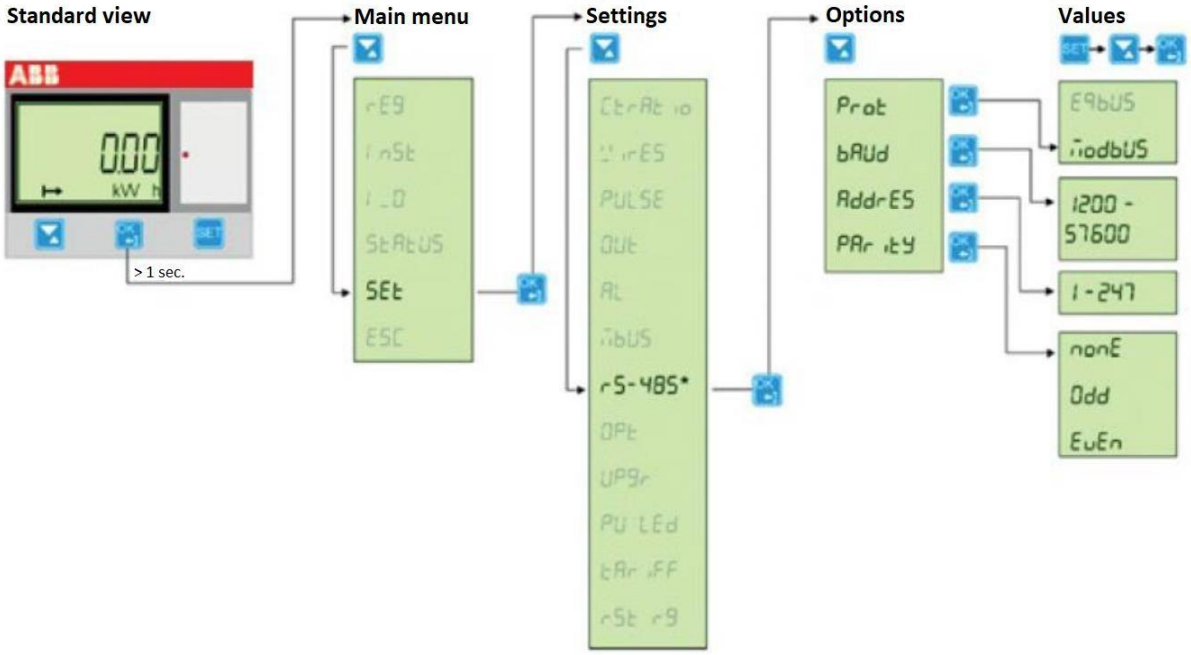
To access the RS 485 terminals of the A/B Energy meters (both direct and indirect types), lift the flap located under the display (if applicable). Make the wiring between the Terra AC Charger and Energy meter as shown in the above figure.

3. Load management configuration

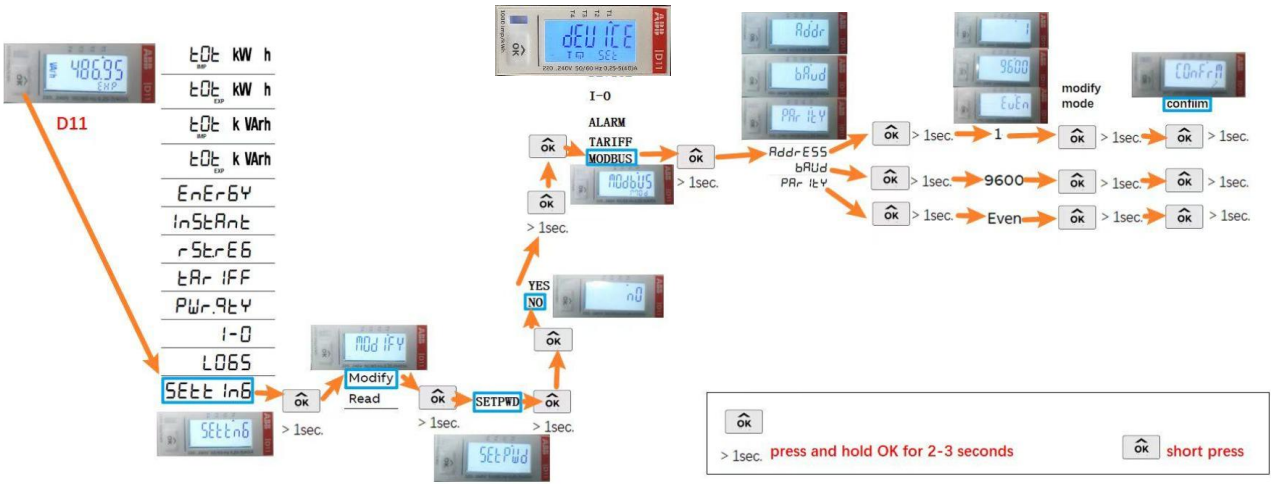
3.1. Energy meter configuration

The images below show the default factory settings of the Energy meter. These are the correct settings for load management and should not be changed.

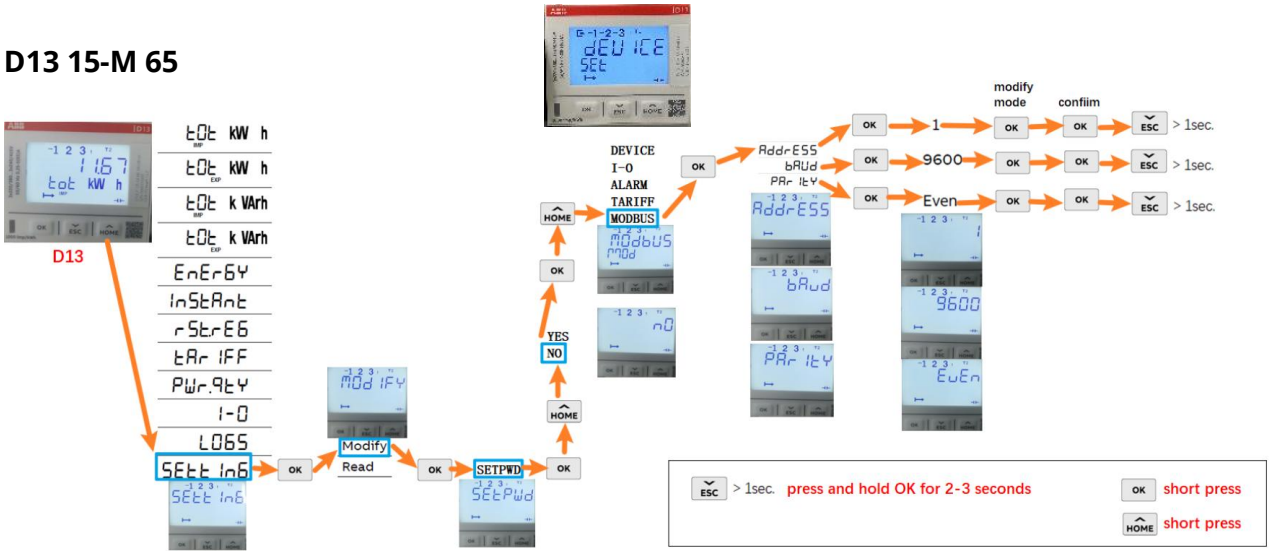
B21/B23 Energy meters



D11 15-M 40



D13 15-M 65

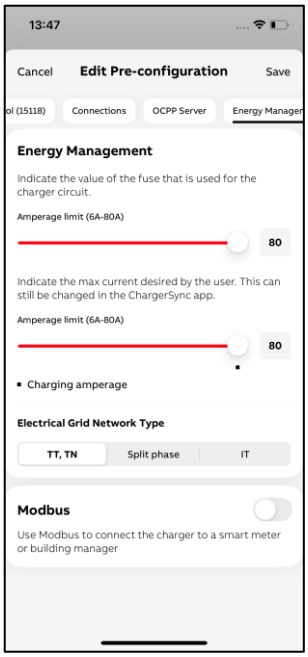


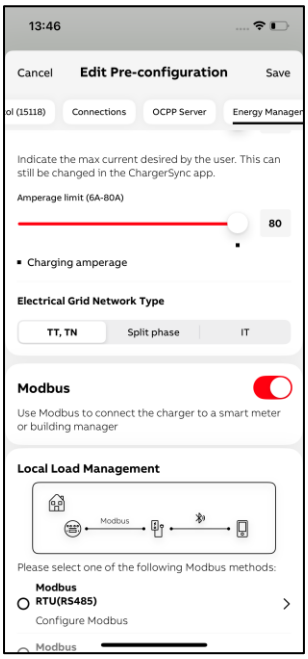
3.2. TerraConfig App

Once the Energy meter has been wired and setup successfully, the load management feature can be configured via TerraConfig App[1].
Follow this link: *TerraConfig App - Overview (Chargedot.com)* for more information about the TerraConfig app.

Please follow the steps below.

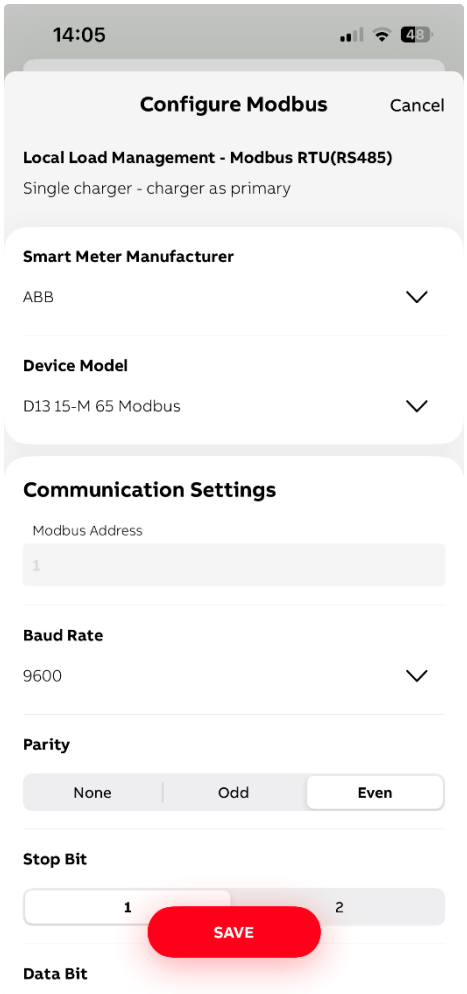
1. Select *Energy Management* from the main page.
2. Enable the Modbus option.
3. Select the first option *Local Load Management* (Energy meter is directly connected with a charger) and select TRU(RS485).





Single Terra AC (charger as Modbus master) is only available for Modbus RTU - RS-485. In this installation setup one charger is connected to one meter. The load management decision comes from the in the charging station's algorithm.

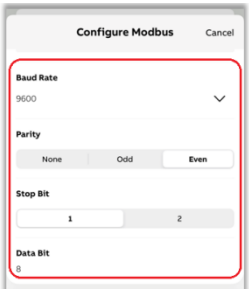
4. Select the correct Energy meter.



Example where ABB model D13 is selected

[1] To configure the Modbus smart meter, the TerraConfig app must be used (v 3.5.0 or higher).

3.2.1. Modbus RTU communication settings

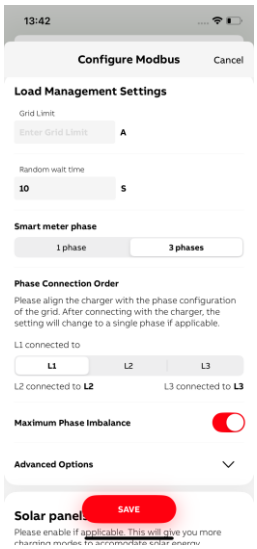


This section describes the settings for the Modbus RT (RS485) communication between the Terra AC charger and the Energy meter used such from ABB.

Both the Terra AC Charger and the energy meter must be configured to the same values. Refer to below table to find the default RTU parameter values.
It is recommended to check if the meter parameters are the same as configured in the charger.

	Default values	
	Terra AC	ABB B21, B23, D11, D13
Baud rate	9600	9600
Parity	Even	Even
Address	1	1

3.2.2. Load management settings



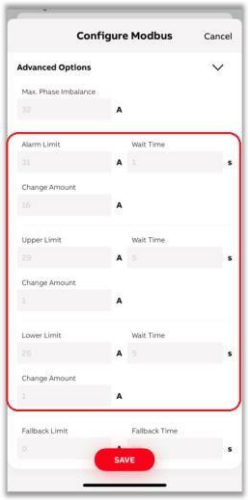
Load management on a residential charger limits or dynamically adjusts the charger's power output to protect or grid connection.

In 'Load Management Settings' the following values should be configured:

- **Grid limit** → maximum limit (in Ampere) of the grid connection for which load balancing should be done.
- **Random wait time** → This is a random wait time (in seconds) for the Terra AC to start charging again from 'pause' mode, to avoid sudden changes in the power consumed from the grid (useful for sites with more than one Terra AC).
- **Energy meter phase** → To identify whether a 1 phase or 3 phase Energy meter is used for metering purposes.
- **Maximum phase imbalance enable** → maximum delta (in Ampere) between two separate phases that is to be pursued, to be enabled only if requested by the local legislations.

NOTICE

Energy meter phase and **Phase connection order** to be in line with installation setup and local regulation.

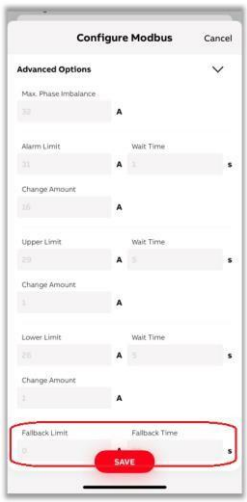


Alarm limit: limit (in Ampere) to which the charger will respond by significantly reducing the power output.
Upper limit: limit (in Ampere) to which the charger will respond by reducing the power output by a small amount.
Lower limit: limit (in Ampere) to which the charger will respond by slightly increasing the power output.

- Default values are set (for easy commissioning/configuration).
- More or less aggressive load management behavior can be configured as needed.

Recommendation/suggestion to keep the

- wait time above 5 seconds for optimal experience.
- During Dynamic Loadmanagement the charger can change its charging current every 5 seconds.
- The EV should generally respond to a change in load within 5 seconds.



Fallback limit: This is the power limit (in Ampere) used by the charger at the time there is no network connection for a certain number of seconds.
Fallback time: This variable can be explained as the amount of time (in seconds) that the charger can be "offline" (experiencing network problems) before the charger goes into "Fallback Status."

When the settings are set, push the **SAVE** button to store the settings, and end with **confirm configuration** to store the configuration on the EV charger.