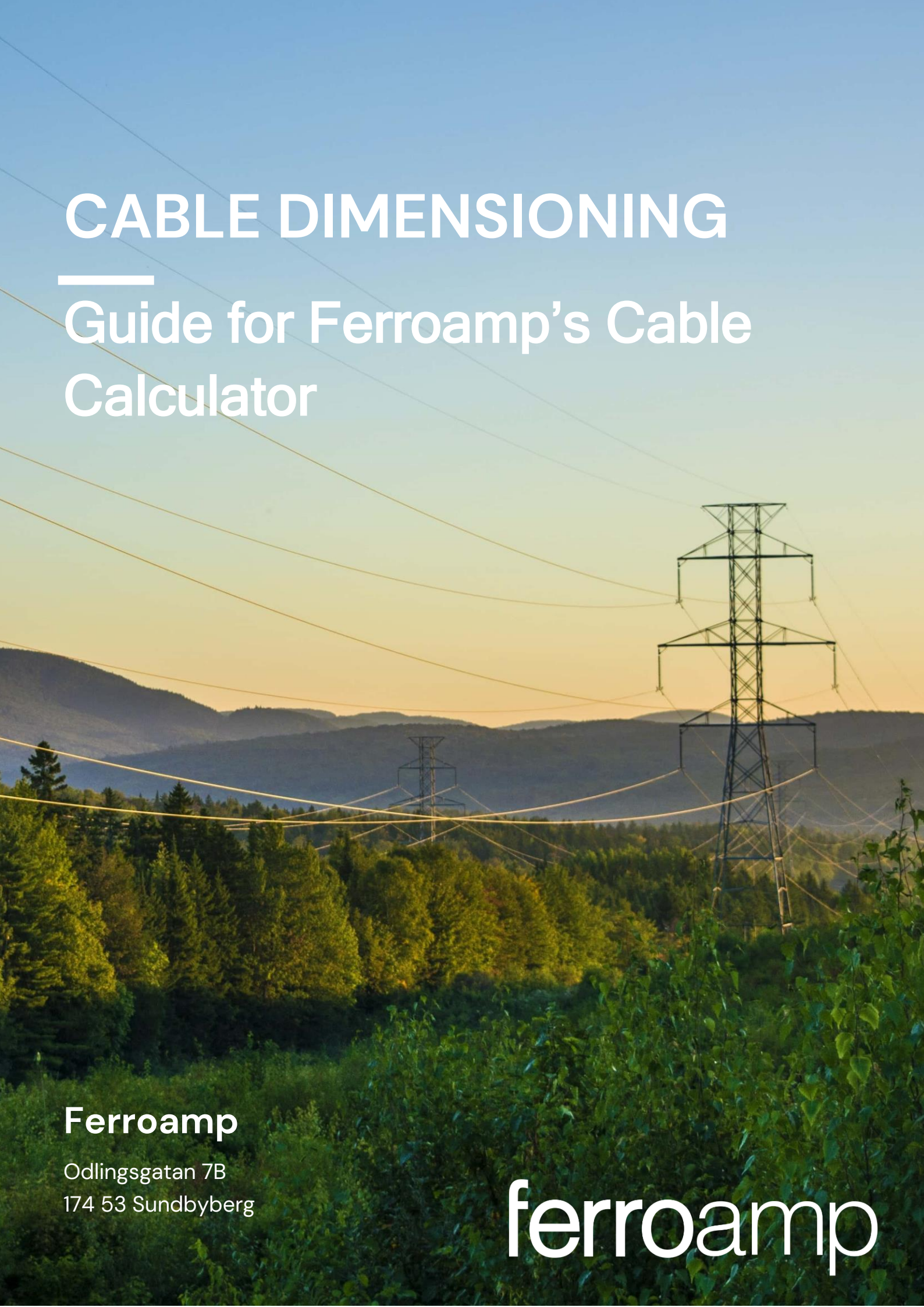
CABLE DIMENSIONING

Guide for Ferroamp's Cable Calculator



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NOTE!!! If it concerns cable sizing for PowerShare, there are other requirements than those informed about in this document. Therefore, PowerShare should ALWAYS be consulted together with Ferroamp before installation. To get assistance with this, contact Ferroamp through the following form: https://ferroamp.com/about-ferroamp/contact-us/sizing/

Content

1. Cable dimensioning

When the Ferroamp system is installed, it is very important that the wiring in the DC grid is dimensioned correctly. Incorrect dimensioning will result in the system communication (PLC) and energy control (Droop control) not functioning as intended. Droop control is the technique that locally adjusts voltage levels in the DC grid to control the flow of energy in a specific direction. Incorrect dimensioning will cause the control to malfunction due to significant natural voltage drops affecting the control. Additionally, since the system communication occurs via PLC (Power Line Communication) in the DC grid, it will also not function properly if the cables are not dimensioned correctly.

2. The system requirements for dimensioning

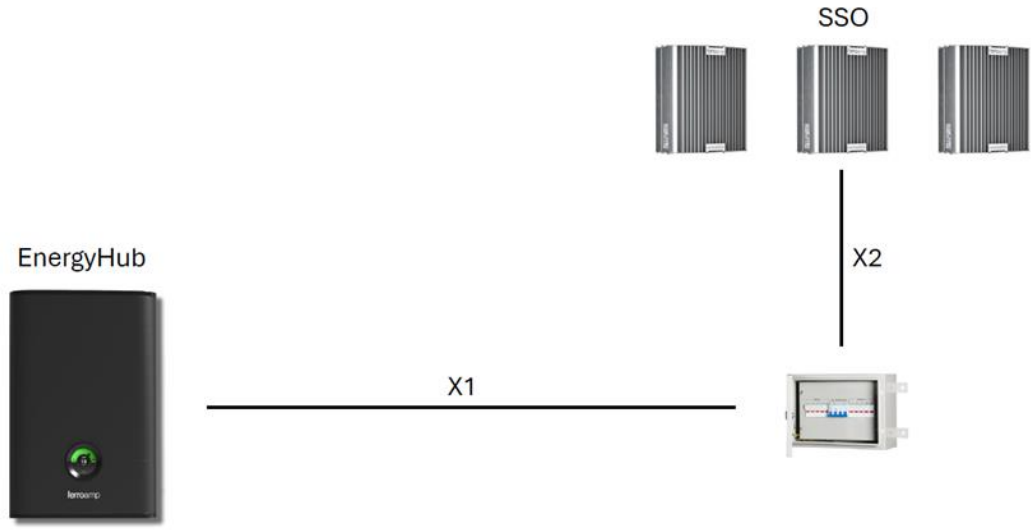
The maximum allowed voltage drop between the different parts of the Ferroamp system are as follows:

- 2% between EnergyHub and SSO
- 1% between EnergyHub and ESO

These requirements apply to the total voltage drop between the components, meaning the sum of the maximum voltage drop for all wiring between EnergyHub and SSO/ESO.

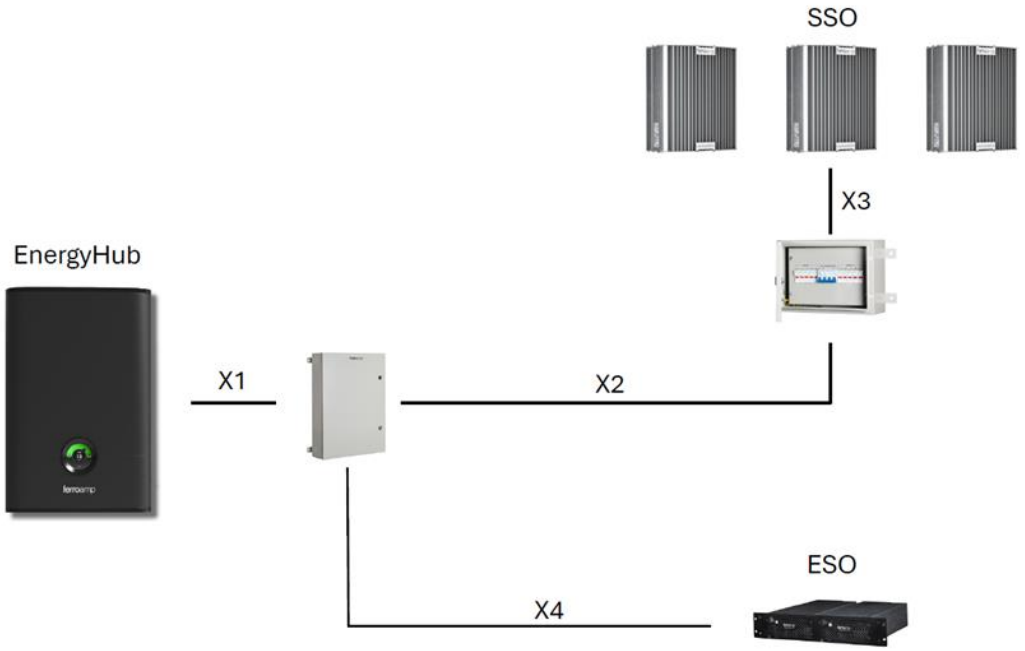
Example 1:

- X1 + X2 must be less than 2%.



Example 2:

- X1 + X2 + X3 must be less than 2%.
- X1 + X4 must be less than 1%.



3. Parameters for the calculator

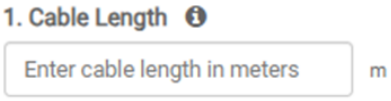
When Ferroamp's cable calculator is used, it provides a recommendation for a cable based on the following:

- Voltage drop
- Energy loss
- Cable temperature

4. Ferroamp's cable calculator

In the following section, we will go through Ferroamp's cable calculator for cable dimensioning and demonstrate how each step should be utilized.

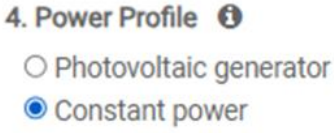
Step 1 - Enter the length of the cable you wish to calculate.



Step 2 – Choose AC or DC. When dimensioning DC-cables, then 760Vrms should be used.

Step 3 – Enter the maximum power that theoretically can flow through that specific cable you are calculating.

Step 4- Select Constant power in the Power Profile; Constant power should always be used here.

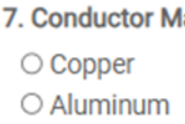


Step 5 – Fill in the requirements you have for the cable. NOTE that the default values provided may need to be adjusted depending on the conditions.

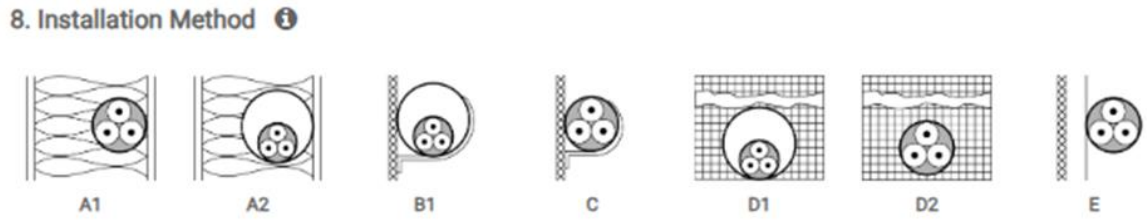
It is the total voltage drop between EnergyHub and SSO that must be less than 2%. For the specific cable we are calculating, the "Maximum allowed voltage drop" must therefore be adjusted so that, together with the other cables in the system, it does not exceed 2%. In the example below, the voltage drop value has been changed to 0.3%.

Step 6 – Select which type of cable to use.

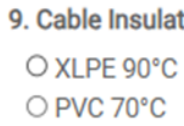
Step 7 - Choose whether copper or aluminum cable should be used. This is important as it affects the recommended dimension based on all three parameters, namely voltage drop, energy loss, and cable temperature. NOTE that for parallel connection of two EnergyHub units or in a PowerShare setup, a center conductor (M) must be connected. Dimensioning of PowerShare should always be consulted with Ferroamp before installation.



Step 8 – Select which installation method to use for the cable. This is important for recommending the right cable based on the cable temperature.



Step 9 – The final step is to choose the type of insulation the cable has.



After that, click on CALCULATE to get a result.

NOTE! It is important to have the system requirements described in point 2 clear before using the cable calculator. The calculator should thus be used for each individual cable, and the cables together must not exceed the limits specified in point 2. For example, if three cables with a voltage drop of 2% are used, the total voltage drop will be 6%, which will cause the system not to function properly. Therefore, simply entering length, power, and cable type and then clicking "calculate" is NOT sufficient. This will result in each cable being dimensioned for a maximum voltage drop of 2%, which may lead to the total voltage drop between EnergyHub and SSO ultimately exceeding 6% when the maximum requirement is 2%.