



Cable Dimensions

Reduce losses in cables.

Introduction

In the pursuit of avoiding unnecessary losses in the system, the cable dimensions play an important role. In order to have a maximum of 1% loss in the cables running from the inverter to the meter, the following cable dimensions are recommended. “Length in meters” indicates the distance from the inverter to the meter.

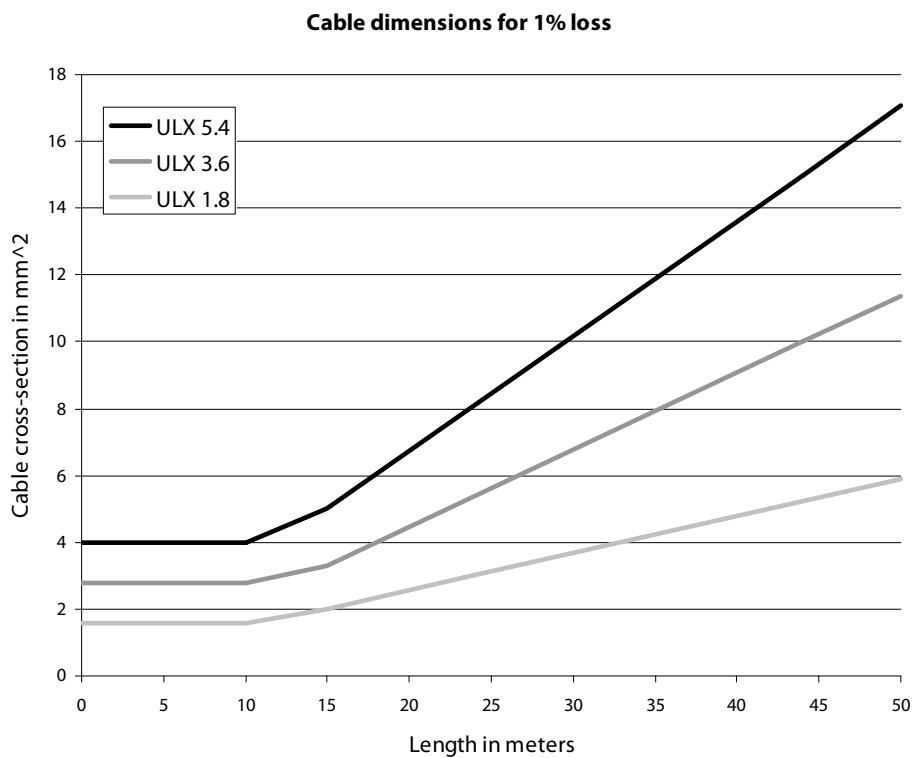


Figure 1 Cable Dimensions

Thus, if the distance between a 3 kW inverter and the meter is 20 meters, as a minimum a 4.6 mm² cable must be used to keep a loss of max.1%. If other values of loss are required, please use the following tables and equations.



AC cable requirements Indoor Inverters

Specification	Inverter type 1.8 kW	Inverter type 3.6 kW	Inverter type 5.4 kW
When selecting cable for the AC installation, ensure to comply with local and national regulation.			
Recommended minimum cable requirements	> 1.5 mm double insulated, approved house wiring cable	> 2.5 mm double insulated, approved house wiring cable	> 4.0 mm double insulated, approved house wiring cable
Indoor use PVC coated wire	≥500 v 1.5 mm ²	≥500 v 2.5 mm ²	≥500 v 4.0 mm ²
Temperature range	0 - +60 °C	0 - +60 °C	0 - +60 °C
Indoor applications Extended temperature range	≥500 v 1.5 mm ² 0 - +90 °C	≥500 v 2.5 mm ² 0 - +90 °C	≥500 v 4.0 mm ² 0 - +90 °C

Outdoor or Open Air applications, weather resistance

Specification	Inverter type 1.8 kW	Inverter type 3.6 kW	Inverter type 5.4 kW
Cord (PUR, polyurethane)	H05RN-F3G 1,5 mm ²	H05RN-F3G 2,5 mm ²	H05RN-F3G 4,0 mm ²
Temperature range	-30 - +60°C	-30 - +60°C	-30 - +60°C
Outer dia. max	10	10	10

Selection of cable type:

To ensure high system efficiency, it is important to choose the correct cable type. A cable with a low conductor cross section increases losses.

Copper resistance for cables with flexible conductor at 20 °C (class 5):

Specification	1.5 mm ²	2.5 mm ²	4.0 mm ²
R Copper	13.3 Ohm/km	7.98 Ohm/km	4.95 Ohm/km
Converted to 10 m cable	0.266 ohm	0.160 ohm	0.099 ohm

Conductor losses

Estimated losses in watt:

Specification	Inverter type 1.8 kW	Inverter type 3.6 kW	Inverter type 5.4 kW
AC current	8 A	16 A	24 A
Loss when using a 1.5 mm ² cable	17 W	68 W	152 W
Loss when using a 2.5 mm ² cable	10 W	41 W	92 W
Loss when using a 4.0 mm ² cable	6.3 W	25 W	57 W

Danfoss Solar Inverters

Jyllandsgade 28
 DK-6400 Sønderborg
 Denmark
 Tel: +45 7488 1300
 Fax: +45 7488 1301
 E-mail: solar-inverters@danfoss.com
 www.solar-inverters.danfoss.com



Estimated losses in per cent of max. power:

Specification	Inverter type 1.8 kW	Inverter type 3.6 kW	Inverter type 5.4 kW
AC current	8 A	16 A	24 A
Loss when using a 1.5 mm ² cable	0.94 %	1.89 %	2.81 %
Loss when using a 2.5 mm ² cable	0.55 %	1.14 %	1.70 %
Loss when using a 4.0 mm ² cable	0.35 %	0.69 %	1.05 %

Formulas for calculating cable resistance:

Cable resistance (go-and-return cable)

$$R = \frac{2 \cdot \ell}{\kappa \cdot A} [\Omega]$$

or

$$R = \frac{2 \cdot \rho \cdot \ell}{A} [\Omega]$$

A Conductor cross section in mm²

ℓ Length of cabling, in m

κ (Kappa) conducting capacity in m/Ω mm² – reciprocal of the specific resistance (Rho) (for copper Cu = 58)

ρ (Rho) specific resistance in Ω mm²/m (for copper Cu = 0.01724)