SG110CX

Short-Circuit Current

SUNGROW

Version 1.0

EN

1. Introduction

This document describes the short-circuit current of SG110CX inverter.

This technical information is intended to provide characteristic values of the short-circuit currents of SG110CX resulting from testing activities in accordance with IEC 60909.

2. Overview

The grid faults requires the support from PV inverters by staying connected to the grid and generating reactive currents to support the grid voltage in VDE-AR-N 4110 grid code. These currents are related to the correct dimensions of the wiring and protection devices at the PV plant and grid levels. Therefore, maximum values of short-circuit currents or characteristic values (as for example Ik'' and Ip) and currents at defined times during voltage drop need to be confirmed.

These characteristic values were defined according to IEC 60909 standard.

Ip Peak short -circuit current: Maximum possible instantaneous value of the prospective short-circuit current.

Ik'' Initial symmetrical short-circuit current: RMS value of the AC symmetrical component (dynamic duration) of a prospective short-circuit current applicable at the instant of short circuit if the impedance remains at zero-time value.

Ik Steady-state short-circuit current: RMS value of the short-circuit current (static duration) which remains after the decay of the transient phenomena.

Note that Ip is given as an amplitude, whereas the values for Ik'' and Ik are RMS.

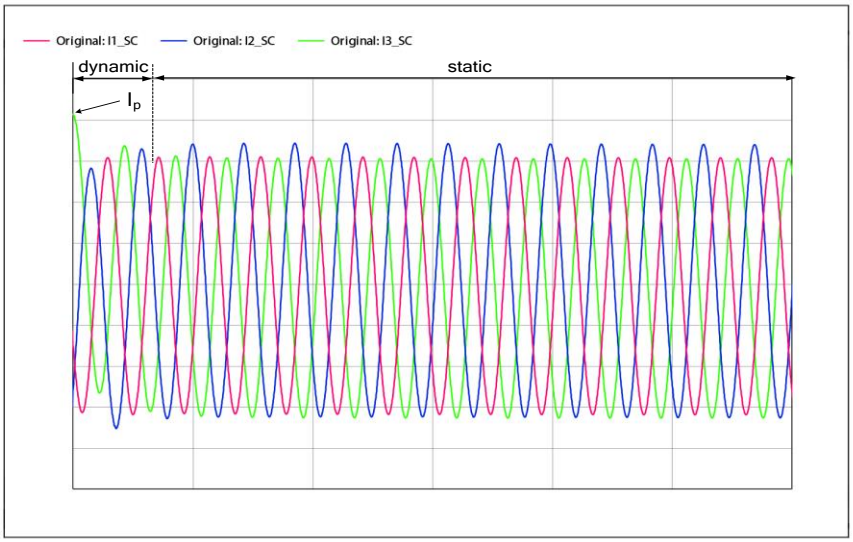

Fig.1. Typical Short-Circuit Current Response to Voltage Dips (PV)

3. SG110CX Short Circuit Current

SG110CX will stay connected from the grid in the event of voltage drop and support the grid voltage by feeding a reactive current into the grid according to a certain characteristic. These apply to all types of short circuits (i.e. to single-phase, two-phase and three-phase short circuits).

The voltage drop causes an immediate reaction of the PV inverter with the peak short-circuit current Ip which is just a peak of max. 40μs with no significant area under the current characteristic curve; afterwards, the inverter limits the current immediately to prevent the inverter from thermal overload, with the initial symmetrical short-circuit current Ik'' which will not last longer than 30ms.

The value for the steady-state short-circuit current Ik will be reached after 30ms and will be maintained during the entire duration of the voltage drop. Furthermore, the value of feed-in reactive current are related to the remaining voltage and the k-factor (default k-factor = 2).

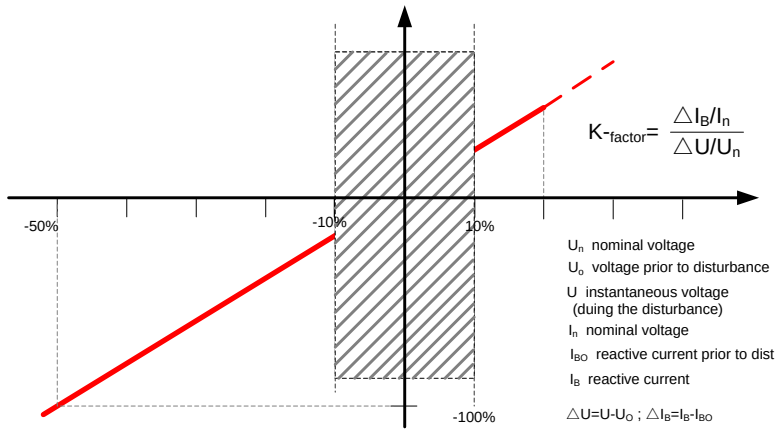

Fig.2. Principle of Voltage Support in the Event of Grid Fault

The response of voltage drop contains one static and two dynamic parts, as shown in the following figure. This approach is similar to the process of model validation by the VDE-AR-N 4110 certification.

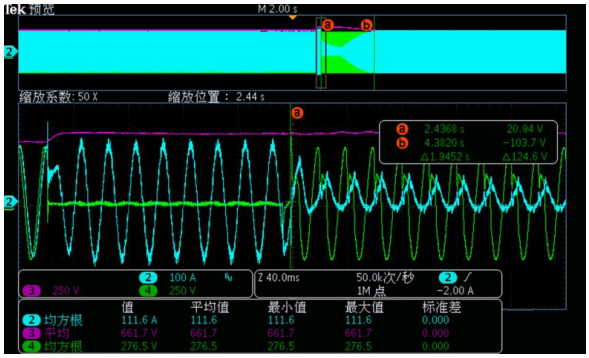

Fig.3. SG110CX Short-Circuit Current Response to Voltage Drop (PV)

The instantaneous values of AC currents and voltages are recorded synchronously with 50kHz (20μs). Positive sequence component are based on measurement of instantaneous voltages and currents are calculated according to IEC 61400-21 (2008). The following table shows the test results for SG110CX.

Inverter type	Peak short-circuit current Ip(A)	Initial symmetrical short-circuit current Ik"(A)	Steady-state short-circuit current Ik(A)	Maximal current Imax(A)
SG110CX	300	175	158.8	158.8