Function modules

3

This chapter describes the licensed function modules that are required for energy infeed to a power grid or to an island grid.

3.1 Overview

As described in the previous chapter, power grid and island grids have different requirements for open-loop and closed-loop control of line infeeds. The software has function modules that can be selected depending on the particular control task.

- **Line transformer**

  The "Line transformer" function module does not require any license and is used to premagnetize and switch the line transformer to the power grid or to the island grid. This function module is activated in the STARTER operating software.

  A detailed description of the activation is provided in chapter "Commissioning".

- **Grid droop control**

  The "Grid droop control" function module enables operation in an island grid. The inverter for the line infeed has the task of controlling the frequency and the voltage in the grid, and assumes an "anti-islanding function". The DC voltage present in the DC link must be controlled by other participants, such as motor-side inverters, or provided by other sources (e.g. from a photovoltaic field).

  Active Line Modules are used in conventional operation for the closed-loop control of the DC-link voltage. With the "Grid droop control" function module, the Active Line Module is used for frequency and voltage control of the grid and ensures stable grid operation.

- **Dynamic grid support**

  The "Dynamic grid support" function module is always required when the grid operators stipulate grid support when feeding power into a power grid or island grid.

  Both power grids and island grids must not collapse, for example in the event of extremely brief voltage dips. A contribution from distributed generating units to the necessary reactive current or short-circuit current is also required in power grids to clear power system faults and to ride through without power failure

The function modules "Grid droop control" and "Dynamic grid support" must be ordered as an option for the SINAMICS S120 CompactFlash card:

- S01: Dynamic grid support for feeding power into a power grid
- S02: Grid droop control for feeding power into an island grid

3.2 Preconditions

Hardware

- Control Unit CU320-2

- Active Line Module, order number ending in ...AA4 with associated Active Interface Module

- Additional Voltage Sensing Module (VSM10) for measuring the line voltage on the primary side of the transformer

- Motor Module for rotating power generation using a generator

Software

- STARTER with firmware version 4.1.5.1 or higher
  SSP for SINAMICS V4.3 SP2

- SINAMICS S120 firmware version 4.3 SP2 or higher

- CompactFlash card for CU320-2 with one of the options

    – S01: Dynamic grid support for feeding power into a power grid

    – S02: Grid droop control for feeding power into an island grid

Hardware to be supplied on-site

- Transformer

- Line contactor

- Generator

3.3 Description of the function modules

3.3.1 Line transformer

Task

The main task of this function module is to magnetize a line transformer before connecting the power generation system to the grid. This magnetization is always necessary and expedient when - as shown in Figure 3.1 - the line transformer forms part of the system and is also disconnected from the grid when the system is shut down. Without magnetization by the inverter, very high transformer inrush currents would otherwise flow when closing the circuit breaker, and these could, among other things, cause excessive grid harmonics.

In addition, the function module allows identification of the transformer data. This can compensate the voltage drop across the transformer during operation and optimize the behavior of the power generation plant at the grid connection point.