

Extended Reactive Power Range

[3.0M/50Hz]

Product Description

Disclaimer [European Market]

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Applicable Documents

The documents referred to in the table below are included for information only. Reference to them in this product description does not make them part of the contract.

Title	Document-No.
Senvion 3.0M122 [50Hz]	PD-3.5-WT.WT.01-A-*-EN
Senvion Power Management Unit	PD-0.0-RG.FM.05-A-*-EN

* If the products referred to in the table above are to be included within the project, the relevant product descriptions in their current version will be amended to the contract.

List of Abbreviations and Units

Abbreviation/Unit	Description
MV	Medium voltage (nominal grid voltage > 1 kV and < 60 kV)
p.u.	Per unit
P_{rated}	Rated active power
P_{WT}	Active power of wind turbine
Q_{WT}	Reactive power of wind turbine
U_{rated}	Rated voltage
U_{WT}	Voltage of wind turbine
WT	Wind turbine (equal to Wind Turbine Generator System [WTGS])

1 Introduction

This document describes the Senvion product Extended Reactive Power Range. The product Extended Reactive Power Range is part of the Senvion grid products.

Senvion offers a variety of grid products which can be added to the standard wind turbine or wind farm configuration to meet the site-specific customer and operator requirements concerning grid connection.

2 Feature Definition

The Senvion grid product Extended Reactive Power Range describes the reactive power capability of the Senvion WT.

Reactive power provision in normal operations

A minimum reactive power range in operations between -1385 kvar under-excited (corresponding $\cos \varphi \approx 0.91$ inductive at rated active power) and +1385 kvar over-excited (corresponding $\cos \varphi \approx 0.91$ capacitive at rated active power) is possible within the frequency range 49.5 Hz - 50.5 Hz at the MV side of the WT transformer.

The minimum available range is defined in the following two figures (P-Q diagram and U-Q diagram).

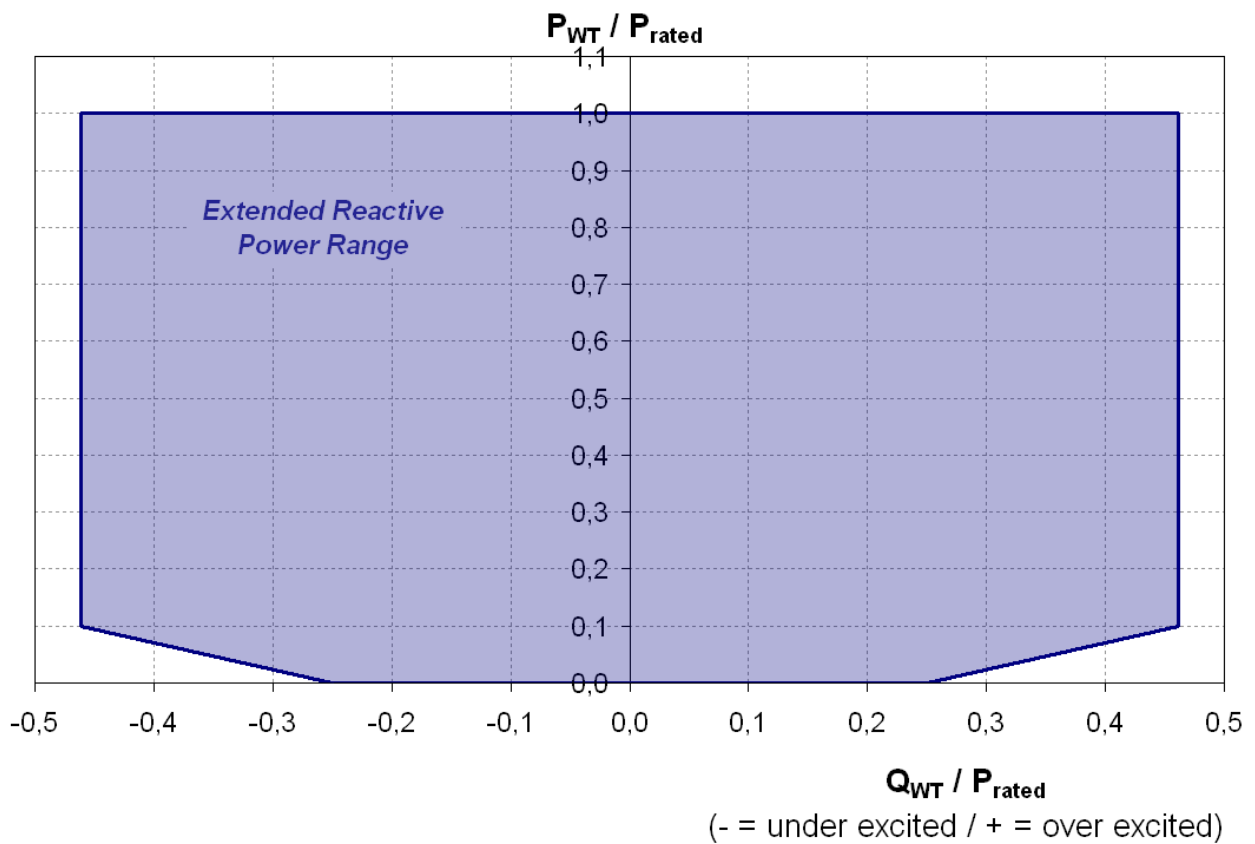


Fig. 2 - 1: Active power / reactive power range

The reactive power provision can be limited to project-specific requirements within the range described in the figure above.

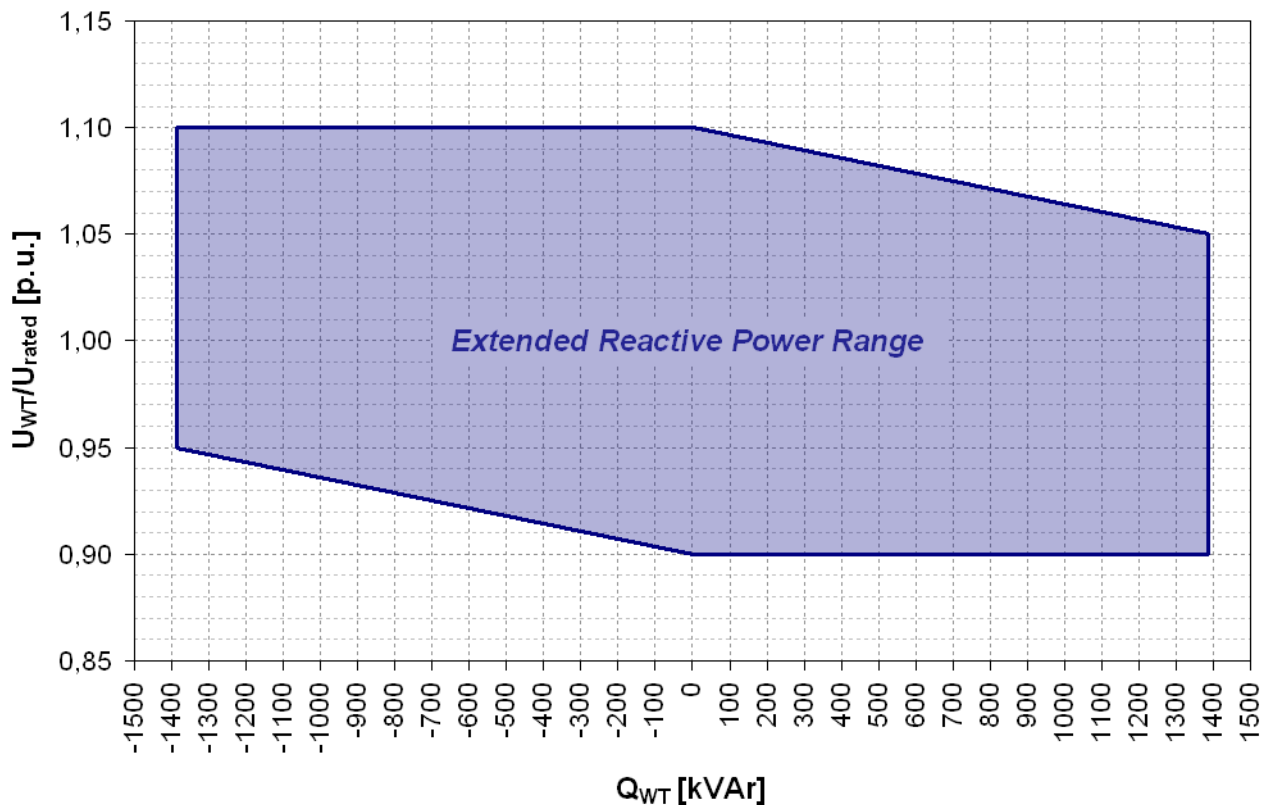


Fig. 2 - 2: Voltage / reactive power range at nominal power 2970 kW (MV side)

The figure above describes the steady state reactive power capability depending on the voltage at the MV side of the WT.

The actual reactive power of the WT can be influenced by tolerances of the control (2.5 % of P_{rated}) and the internal reactive power consumption. The diagrams in both figures above have already included up to 33 kvar internal consumption.

Reactive power provision during stand still

Reactive power provision during standstill may be activated if requested. For this request to be considered it must be submitted to Senvion at least 26 weeks prior to planned commissioning of the wind turbines. Based on this request, Senvion will provide an offer containing the potential additional costs associated with activation of reactive power provision during standstill.

3 Scope of Supply

3.1 Hardware & Software

The capability described within this product description defines the single wind turbine capability only. The wind turbine capability has to be integrated into wind farm control functionalities by using further grid products or Senvion SCADA Products, which need to be added to the scope of supply of Senvion.

If the described capabilities are sufficient to fulfill the requirements at the point of interconnection of the whole wind power plant has to be investigated by the customer. A necessary reactive power compensation equipment is not part of this product.

3.2 Installation & Commissioning

Senvion is responsible to set up the product. The product scope does not include additional tests.