Project-specific controller tuning blue'Log XC

Item no. 557.201

Define control behavior in the planning phase.

Description

The controller blue'Log XC is already pre-parameterized at the factory to guarantee manufacturer-independent, robust control even with a high diversity of available PV inverters on the market.

Whether highly dynamic Zero feed-in for PV self-consumption systems or reactive power control of solar power plants with improved response time requirements – through project-specific controller tuning, the controller blue'Log XC guarantees the required dynamics already in the planning phase.

The harmonization of all dead times in the system enables a precise adjustment of the control behaviour and makes time-consuming, manual controller tuning in the field (trial-and-error) no longer necessary.

Exemplary requirements on control dynamics

- **Initial delay T_V**: Initial delay in activation of active power frequency response (LFSM-O).
- **Rise time $T_{rise\ 90\%}$**: Time between the setpoint step change and the point in time at which the controlled variable (for example, reactive power Q) reaches 90 % of the setpoint change for the first time.
- **Settling time $T_{settling\ \Delta x}$**: Time between the erratic setpoint change and the point in time at which the transient process has decayed to such an extent that the controlled variable (for example, reactive power Q) lies within the tolerance band around the steady-state value and remains there.

	Initial delay T_V	Rise time $T_{rise\ 90\%}$	Settling time $T_{settling\ \Delta x}$
Active power decrease at overfrequency (LFSM-O)	≤ 2 s [1]	≤ 2 s [2]	≤ 20 s [2]
Active power controllability P_{var}	–	–	0.33 … 0.66 %/s [3]
Voltage control Q (U droop)	–	1 … 5 s [4]	5 … 60 s [4]
Reactive power control Q_{var}	–	1 … 5 s [5]	6 … 60 s [6]
Power factor control cos ϕ_{var}	–	≤ 60 s [5]	≤ 60 s [6]

[1] Requirement according to Network Code (NC) Requirements for Generators (RfG) / EU regulation 2016/631, Article 13(2)(e).
[2] Requirement according to VDE-AR-N 4110:2018-11 (TCR medium voltage), chapter 10.2.4.3 (Power-generating system Type 2 / PV system).
[3] Requirement according to VDE-AR-N 4110:2018-11 (TCR medium voltage), chapter 10.2.4.1 (No absolute settling time).
[4] Requirement according to Network Code (NC) Requirements for Generators (RfG) / EU regulation 2016/631, Article 21(3)(d).
[5] Requirement according to VDE-AR-N 4120:2018-11 (TCR high voltage), chapter 10.2.2.4.
[6] Requirement according to VDE-AR-N 4110:2018-11 (TCR medium voltage), chapter 10.2.2.4.

Extended controller parameterization, active power

- The behaviour of the active power control can be adjusted by parameterization depending on system-specific and regulatory requirements.
- The following parameters are available for this purpose:

Parameter	Value range	Factory setting [7)]
Controller sample time t_s	200 ms | 500 ms	500 ms
Proportional gain coefficient K_p	-1,000 … 1,000	0.1180
Integral gain coefficient K_i	-1,000 … 1,000	0.0672
Dead zone / $DZ_{lower\ limit}$	-10 … 0 %	-0.5 %
Dead zone / $DZ_{upper\ limit}$	0 … 10 %	0 %
Correction value limiting / $P_{y,\ lower\ limit}$	0 … 125 %	0 %
Correction value limiting / $P_{y,\ upper\ limit}$	0 … 125 %	125 %

[7)] The controller tuning in the factory setting guarantees a PT1 transient response for the active power control with 3 tau = 60 s (tolerance band ΔP = 2 %) for a dead time of the controlled system (Power-generating unit (PGU settling time) of 3.0 s.

Extended controller parameterization, reactive power

- The behaviour of the reactive power control can be adjusted by parameterization depending on system-specific and regulatory requirements.
- The following parameters are available for this purpose:

Parameter	Value range	Factory setting [8)]
Controller sample time t_s	200 ms | 500 ms	500 ms
Proportional gain coefficient K_p	-1,000 … 1,000	0.1110
Integral gain coefficient K_i	-1,000 … 1,000	0.0493
Dead zone / $DZ_{lower\ limit}$	-10 … 0 %	-0.5 %
Dead zone / $DZ_{upper\ limit}$	0 … 10 %	0.5 %
Correction value limiting / $Q_{y,\ lower\ limit}$	0 … 100 %	60 %
Correction value limiting / $Q_{y,\ upper\ limit}$	0 … 100 %	60 %
Correction value limiting / $\cos \phi_{y,\ lower\ limit}$	0 … 1	0.8
Correction value limiting / $\cos \phi_{y,\ upper\ limit}$	0 … 1	0.8

[8)] The controller tuning in the factory setting guarantees a PT1 transient response for the reactive power control with 3 tau = 60 s according to VDE-AR-N 4110:2018-11 (TCR medium voltage) for a dead time of the controlled system (Power-generating unit (PGU) settling time) of 1.5 s.

Additional notes

- **Data collection**: Data collection sheet with project-specific data and control requirements needs to be provided by customer.
- **Simulation results**: The simulation results are provided with the ‘Simulation Results Report’.
- **Control behavior**: Deviations of the real control characteristics (rise time, settling time, steady-state error) from the simulation result cannot be completely avoided.
- **Controller parameterization/site acceptance tests (SAT)**: Controller parameterization and execution of grid code compliance (GCC) site acceptance tests (SAT) are not within scope of delivery.