PowerPlant Network

SPPC
Smart Power Plant Controller

Bachmann electronic has developed a product that offers the required functionality for controlling different energy generators and components combined to form a higher-level power station and also fully meets the requirements of the new VDE-AR-N4120:2018 and the new VDE-AR-N4110. An energy park consists of power generation units (PGU), such as wind turbines (WTGs), CHP units, photovoltaic installations (PVs) or battery storage systems, as well as consumers (hybrid farms). These must all be combined and controlled as generation plants by a controller at the point of common coupling (PCC) if the total connected load ratings are ≥135 kW (new VDE guideline from May 2019).

Bachmann has developed a controller as a software module for the control system that provides all the functions and setpoint definitions required by the guideline for active and reactive power. Besides the controller module, a simulation model in Mathworks Matlab (R) is also provided for the PC, which can be integrated in standard simulation software for certifying the customer's overall system. Other simulation models, e.g. DIgSILENT PowerFactory, can also be used as required.

In addition to the actual controller core, the SPPC also features an operational management software which includes a status machine for general functions and controls as well as event handling. Bachmann offers a high-performance CPU as a hardware platform for the park controller, which offers in combination with the GMP232/x grid measurement and protection module an ideal solution for the acquisition of measured values at the grid connection point. Additional modules from the Bachmann hardware portfolio can also be incorporated as required. The modular software structure of the controller makes it possible to expand this product to suit customer requirements.

Part Type Designation	Part Number
SPPC_VA OPT1 RT license (Alternative dispatcher)	00039842-01
SPPC_VA OPT2 RT license (Extended control)	00039842-02
SPPC_VA OPT3 RT license (Extended historization)	00039842-03
SPPC_VA OPT4 RT license (Voltage control)	00039842-04
SPPC_VA RT license for 0,1 MW to 2,9 MW output (in steps of 0,1 MW)	00039855-01 to 00039855-29
SPPC_VA RT license for 3,0 MW to 9,5 MW output (in steps of 0,5 MW)	00039855-30 to 00039855-95
SPPC_VA RT license for 10 MW to 50 MW output (in steps of 2 MW)	00039856-10 to 00039856-50
SPPC - DIgSILENT PowerFactory model	00040516-00
SPPC - PSCAD model	00040516-10
SPPC - FMU model	00040516-20

FGH-K-2020-001
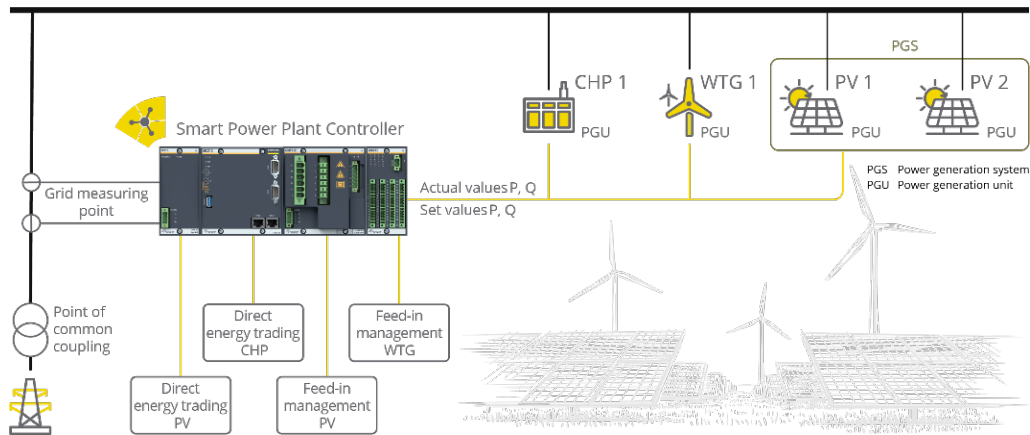**FGH**
CERTIFIED GRID CODE COMPLIANCE

Fig. 1: Connection example of a Smart Power Plant Controller system (schematic)

The product also includes a local operation and configuration visualization tool which can be called with any browser via a web server on the controller. Topologies, signal flows and charts can be displayed, and setpoints can also be defined. The historization of active power setpoints, as required by the guideline, has also been implemented on the system and data can also be exported via the visualization. There is also a separate area that makes it possible to carry out various tests for commissioning, in order to ensure that the parameters of the Smart Power Plant Controller are correct.

Bachmann places prime importance on access security. For this reason, the Smart Power Plant Controller also features a user and access management system that meets the highest safety standards while still enabling a flexible setup by the user. Thanks to the host of communication protocols available in the Bachmann automation system, it is possible to respond flexibly to the wide range of different communication connections, e.g. to direct energy trades.
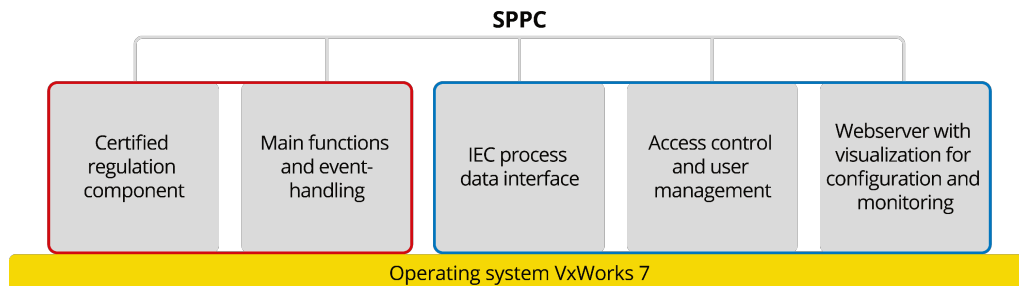

Fig. 2: Software structure of Smart Power Plant Controller on the M200 Controller
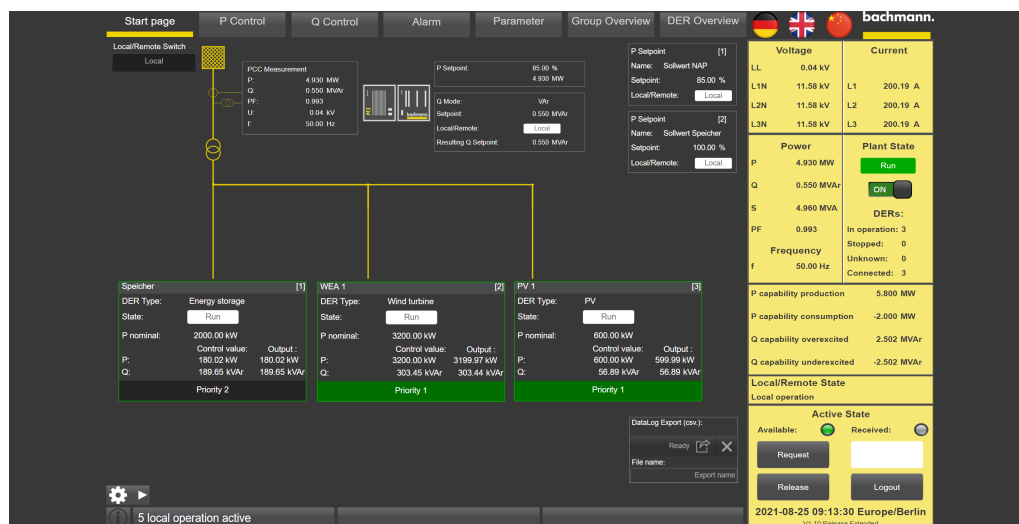

Fig. 3: Browser-supported operating and configuration visualization tool

Smart Power Plant Controller

General / Communication	
Technology	Expandable software package for M200
Hardware	NT255, MC206 or MC212, GMP232/x (recommended), GIO2xx (recommended), other modules (optional)
Interfaces to the PGU	Analog (4 mA to 20 mA), Modbus TCP, IEC 60870-5-101/104, IEC 61850, IEC 61400-25, DNP3, bluecom, PROFIBUS®, PROFINET®, EtherCAT®
Interface to the power supply company / energy trader	Analog (4 mA to 20 mA), Digital (24 V DC), Modbus TCP, IEC 60870-5-101/104, IEC 61850, IEC 61400-25, DNP3, bluecom

Project development	
Mapping configurations for communication protocols	SolutionCenter with special plug-ins (WTT configurator plugin)
Controller configuration	HMI visualization

Functionality	
Main functionality of the connection service license	Active power control • Setpoint specification (P) Reactive power control • Setpoint specification (P) • Setpoint specification with voltage limitation • Q(U) characteristic • Q(P) characteristic • Cos φ • Cos φ (P) characteristic Higher-level functions • Controller bridging "slave-mode" • Communication error behavior • Behavior failure power supply / UPS • Determination of switching behavior • Priorization of simultaneously applied setpoints • Data historization 18 months • Easy logging of data points as CSV and export to USB stick • Simulation model • Enabling signal for reconnection after powerlessness • Limitation of the control speed (on/settling times) • EZE/EZA grouping • Event system
+ Option 1 Alternative dispatcher	Higher-level functions • Alternative dispatcher with auto. generation/consumption distribution with feed-in limitation at the NAP (charging stations and storage)

Functionality	
+ Option 2 Extended control	Active power control • Primary control reserve (FCR) • Power reserve • P(f) for EZE type 1/2 • P(f) for storage Higher-level functions • Line loss compensation for P und Q setpoints
+ Option 3 Extended historization	Higher-level functions • Freely configurable, optimized data historization on the SPPC • Extended data logging incl. export to database • OPC UA interface for data decoupling (also to Bachmann SCADA)
+ Option4 Voltage Control	Reactive power control • Voltage regulation with line loss compensation (remote bus voltage control) • Voltage regulation with U(Q) characteristic

User Management	
Access security and user management	• Extended software package for the M200 • AES256 encryption of users/passwords • Location based prioritization control • Highly granular structuring of access rights for groups and users • Logging

Visualization	
Web visualization	Browser-supported local operating and configuration visualization tool via M1 webMI (web server for M200)
Project development	atvise® builder for M1 webMI

Licensing	
Connection service runtime license	Hardware (M200) connected runtime license depending on connection service Contains all functions certified according to VDE-AR-N 4110/4120
Options 1 to 4 runtime license	Hardware (M200) connected runtime license The option licenses can be combined together with the connection service license as an extension of the scope of functions.