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Power Engineering | Smart Grid | Micro Grid

Training systems on the generation, distribution and management of electrical energy:

- Power engineering training system, distribution training system
- Energy generation training system, renewable energy generation training system
- Transformer training system, high-voltage transmission lines training system, protective systems training system
- Energy management training system, smart grid training systems

The Lucas-Nülle training systems have been designed in anticipation of the newest developments:

- Smart measuring instruments provided with various communication interfaces (e.g. LAN, RS485, USB) and control elements
- SCADA Power Engineering Lab software for the intelligent control and evaluation of "smart grids" using Soft PLC
- SCADA software designed for educational purposes
- Permits investigation of dynamically alternating loads and power generation inside the laboratory
- Intelligent energy management
- Modular integration of renewable energies into a smart grid using protective engineering
- Wind power plant with doubly-fed asynchronous generator (DFIG) and synchronisation to the grid
- Interactive multimedia training course

"Micro Grids" - Control of stand-alone networks



"Micro Grids" - Control of stand-alone networks

A stand-alone power network is a type of power supply network which is closed and has no active lines coupling it to other parts of the electrical power supply grid. A stand-alone network is markedly smaller than a combined electricity grid and does not usually incorporate high-voltage power lines. For this type of network there are two distinct modes of operation, stand-alone mode and isolated parallel or generator-to-generator operation. This type of supply network is frequently used for the industrial power supplies of large businesses. When this stand-alone network is connected to a smart grid, it is referred to as a microgrid. This type of grid has three different operating modes: on-grid, off-grid and dual mode. Microgrids will be playing a huge role in the smart grids of tomorrow. A microgrid features the following benefits:

- Transmission and transformer losses are reduced
- More independence from major power suppliers
- Smart grid act as a back-up system
- Intelligently controlled power supply and consumption thanks to SCADA
- Power generation using renewable energy sources
- Optimizing the quality, reliability and sustainability of electricity

EMG 2 Micro Grid - Isolated parallel operation

EMG 2 Micro Grid - Isolated parallel operation

Training contents



Training contents

- Control of multiple generators in a stand-alone network
- Control of multiple generators in parallel generation mode
- Coordination of energy needs and generating capacity in stand-alone networks.
- Use of modern information technology such as networked sensors/actuators, PLC control and the SCADA operating environment
- Smart metering of a "slack bus" to make a sub-network autonomous.
- Manual control
- Voltage control
- Frequency control
- Torque control
- Power factor (cos phi) control
- Droop control

Supplementary Set comprising:

Pos.	Product name	Bestell-Nr.	Anz.
1	HMI (Human Machine Interface) for generators	C03301-5L	1
2	Synchronization Unit	C03212-6V	1
3	Power switch module	C03301-5P	1
4	Three-phase synchronous machine with smooth core rotor, 1 kW	SE2682-5Q	1

Additionally required, dynamic servo machine test stand:

Pos.	Product name	Bestell-Nr.	Anz.
5	Servo machine test stand for 1kW machines incl. software ActiveServo (D,GB,F,E)	C03636-6Y	1
6	Rubber coupling sleeve, 1kW	SE2662-6A	1

7	Coupling guard 1 kW with LED lighting	SE2662-7D	1
8	Shaft end guard, 1kW	SE2662-6C	1

Power supply:

Pos.	Product name	Bestell-Nr.	Anz.
9	Exciter voltage controller with de-excitation	CO3301-5G	1
10	Motor protection switch, 3 pole, 1.8-2.5A	CO3212-1P	1
11	Multiple socket outlet, 6 fold, with illuminated switch	ST8010-4J	1

Accessories:

Pos.	Product name	Bestell-Nr.	Anz.
12	Safety connecting plug 4mm with tap (2x), black, 1000V/32A CAT II	SO5126-3R	30
13	Safety connecting plug 4mm with tap (2x), blue, 1000V/32A CAT II	SO5126-3V	5
14	Safety connecting plug 4mm with tap (2x), gr/ye, 1000V/32A CAT II	SO5126-3W	5
15	Set of safety measurement cables, 4mm (31 leads)	SO5148-1L	1
16	Set of 4 safety measurement leads, 4 mm, length 10m, includes fastening set	SO5148-1Z	1
17	Mobile aluminum experiment stand, 3 levels, power strip with 6 sockets, 49"x28"x79" WxDxH (1250x700x1995mm)	ST7200-4C	1
18	Protected power distribution for working stations	ST8008-8N	1

Additionally recommended:

Pos.	Product name	Bestell-Nr.	Anz.
19	Display for Power Generation equipment	CO3301-7F	1

20	Monitor holder for flat screen monitor of weight up to 15kg / 33lbs	ST8010-4T	1
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21	Keyboard adapter for flat screen monitor holders	ST8010-4G	1
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22	Protection cover for three-level experiment trolleys	ST8010-9Y	1
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