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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 1 Micro Grid - Stand-alone operation

EMG 1 Micro Grid - Stand-alone operation

Training contents



Training contents

- Fundamentals of isolated, stand-alone networks.
- Control of a generator in a stand-alone network.
- 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

Basic equipment set, consisting of:

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

Additionally required, dynamic servo machine test stand:

Pos.	Product name	Bestell-Nr.	Anz.
8	Servo machine test stand for 1kW machines incl. software ActiveServo (D,GB,F,E)	CO3636-6Y	1
9	Rubber coupling sleeve, 1kW	SE2662-6A	1
10	Coupling guard 1 kW with LED lighting	SE2662-7D	1

Media:

Pos.	Product name	Bestell-Nr.	Anz.
11	Interactive Lab Assistant: Control of stand-alone networks with Micro Grid	SO2800-3X	1

Software:

Pos.	Product name	Bestell-Nr.	Anz.
12	Software SCADA for Power Engineering, designer software	SO4001-3F	1
13	Patch cable Cat5E 1x 1 m yellow, 2x 2 m yellow	LM9057	1
14	USB 2.0 Ethernet adapter, 10/100	LM8257	1
15	5-Port Ethernet Switch	LM9988	1

Power supply:

Pos.	Product name	Bestell-Nr.	Anz.
16	Three-phase supply for electrical machines	CO3212-5V	1
17	Exciter voltage controller with de-excitation	CO3301-5G	1
18	Motor protection switch, 3 pole, 1.8-2.5A	CO3212-1P	1
19	Multiple socket outlet, 6 fold, with illuminated switch	ST8010-4J	1

Measuring instruments:

Pos.	Product name	Bestell-Nr.	Anz.
20	Three-phase power quality meter, display and long-term memory	C05127-1S	1

Accessories:

Pos.	Product name	Bestell-Nr.	Anz.
21	Safety connecting plug 4mm with tap (2x), black, 1000V/32A CAT II	S05126-3R	45
22	Safety connecting plug 4mm with tap (2x), blue, 1000V/32A CAT II	S05126-3V	11
23	Safety connecting plug 4mm with tap (2x), gr/ye, 1000V/32A CAT II	S05126-3W	10
24	Set of safety measurement cables, 4mm (31 leads)	S05148-1L	1
25	Safety measurement cable (4mm), 25cm/10", red, CAT III ~ 1000 V, CAT II / 32A	S05126-8A	2
26	Safety measurement cable (4mm), 25cm/10", black, 600 V, CAT III ~ 1000 V, CAT II / 32A	S05126-8B	14
27	Safety measurement cable (4mm), 25 cm/10", blue, 600 V, CAT III ~ 1000 V, CAT II / 32 A	S05126-8E	3
28	Safety measurement cable (4 mm), 100cm/40", blue, 600 V, CAT III ~ 1000 V, CAT II / 32 A	S05126-9A	1
29	Safety measurement cable (4 mm), 100 cm, green/yellow, 600 V, CAT III ~ 1000 V, CAT II / 3	S05126-9C	1
30	Safety measurement cable (4mm), 150cm, green, 600 V, CAT III ~ 1000 V, CAT II / 32A	S05126-9P	2
31	Mobile aluminum experiment stand, 3 levels, power strip with 6 sockets, 49"x28"x79" WxDxH (1250x700x1995mm)	ST7200-4C	1
32	Protected power distribution for working stations	ST8008-8N	1

Additionally recommended:

Pos.	Product name	Bestell-Nr.	Anz.
33	Display for Micro Grid equipment	CO3301-7L	1
34	Monitor holder for flat screen monitor of weight up to 15kg / 33lbs	ST8010-4T	1
35	Keyboard adapter for flat screen monitor holders	ST8010-4G	1
36	Protection cover for three-level experiment trolleys	ST8010-9Y	1