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Network-capable Peak Load Optimization and Energy Management System



Ethernet TCP-IP

Application / functions

- Optimization within imposed utility interval
- Instantaneous power monitoring
Peak load optimization up to 100 MW and 8 transformer stations
Emergency generator control and monitoring
- Utility grid management
- Energy data acquisition
- Gateway functions for use with BMS / EMS
- Network-enabled

REDUCE ENERGY COSTS

through peak load optimization

TARIFF MONITORING

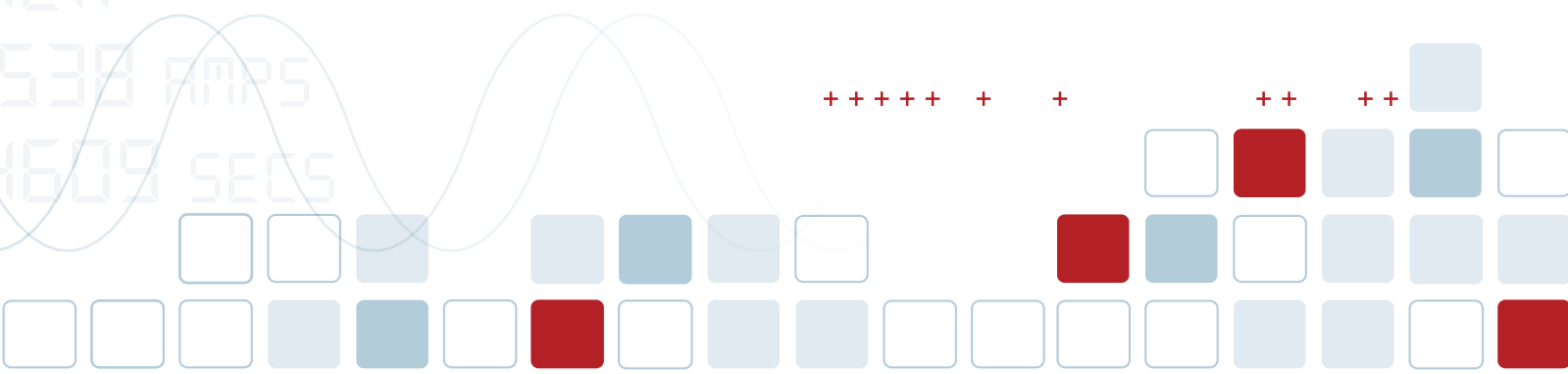
based on accurate recording of consumption and load profile data

IMPROVE ENERGY RELIABILITY

through intelligent grid management

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System Description

EQUIPPED with intelligent monitoring technology and state-of-the-art microelectronics, the ALC-expert is designed to measure and control power demands in real-time. Based on live energy data, priorities, and user parameters, connected loads are curtailed to ensure that kW demand stays below the desired threshold. Expensive demand peaks are prevented without jeopardizing building operations.

COMPACT SYSTEM architecture allows for commercial and industrial applications. The system is certified for easy installation in existing or new facilities.

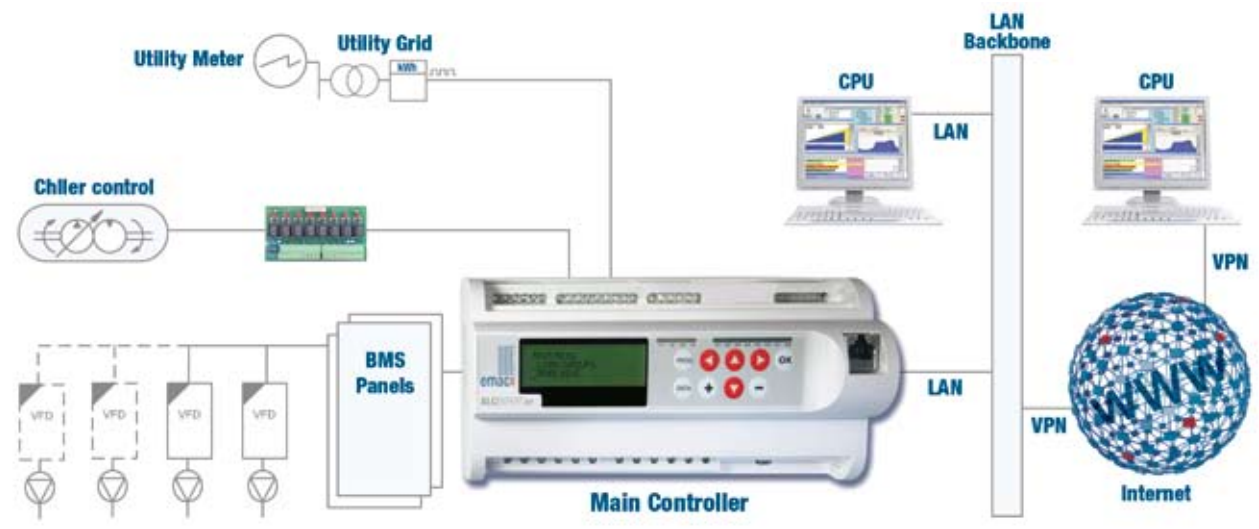
USER-FRIENDLY design with backlit graphic display, push-button interface, screw terminals, and integrated power supply.

EASY to integrate in facilities with existing Building Management System (BMS /EMS) technology via open communication protocols (Ethernet, LON, Dupline, Instabus, EIB)

MODULAR construction with many options for up to 128 load groups and more than 512 digital and analog inputs/outputs for measuring and controlling building variables through intelligent field bus communication.

NETWORK-ENABLED (Ethernet TCP-IP) hardware and software for easy integration of systems into existing and new IT infrastructure

DYNAMIC TRENDING is performed with instantaneous calculations of load trends, establishing necessary correction factors in order to optimize the load within the preset target values of the imposed utility interval without jeopardizing operations.





Savings / Applications

DEMAND PEAKS are costly! The electric demand for a facility usually varies hourly, daily, and seasonally. The supplier must have generating capacity, transformers, and distribution equipment installed to provide the maximum or peak demand at any time—even if that peak demand occurs for only one hour a month. The supplying utility recovers the cost of providing the equipment required for this maximum demand in commercial and industrial rates by a separate charge called the demand charge

WITH THE ALC-EXPERT YOU BENEFIT FROM THE FOLLOWING SAVINGS:

Up to 30% lower demand costs (kW)

Up to 30% lower energy costs (kWh)

Up to 30% lower installation cost.

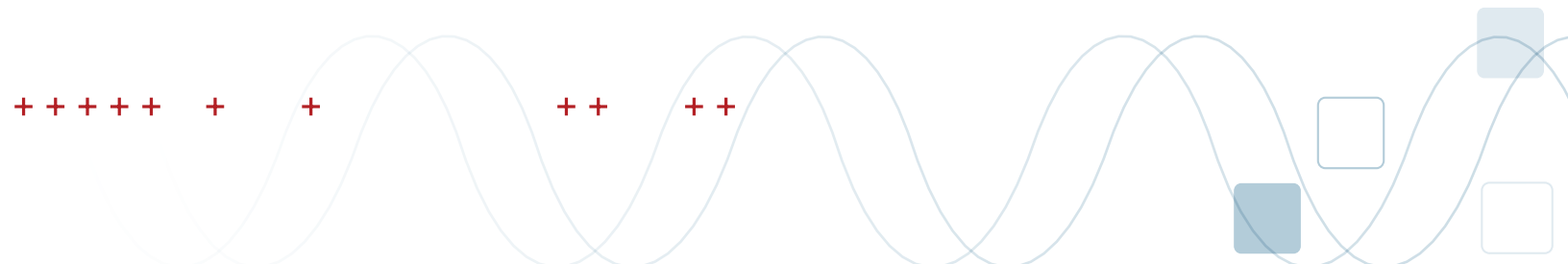
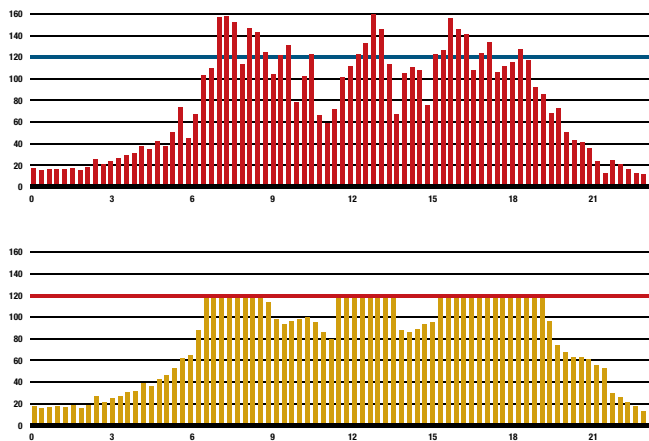
THE OPTIMIZATION PRINCIPLE The electrical power used is transmitted synchronously to a utility measurement device (in most cases, the utility supplies measurements via power impulses). The transmitted actual power is monitored by a microprocessor, controlled and continuously compared with target values. Trending is performed to evaluate power ratios in order to switch loads / load groups connected to the ALC-expert on, off or reducing, depending on the preset

values (maximum kW and priorities).

A microprocessor calculates all necessary switching operations and thereby prevents loads / load groups from being switched off or reduced unnecessarily, and enables optimal utilization of the set nominal power consumption.

Based on the list of equipment identified for the demand reduction and the demand limit set for a particular month, the Emacx Demand Control System starts to control the equipment. Each month of the year has an assigned maximum demand threshold the system will maintain. Continuous synchronous scanning and load analysis ensures optimum operation without exceeding the preset kW value.

The ALC-expert controls equipment as a function of assigned priority levels and duty break parameters. When called for curtailment, designated equipment is reduced for a short duration until the demand reduction objective is achieved.





Applications / Features

EMACX AUTOMATED LOAD CONTROL SYSTEMS HAVE NUMEROUS BENEFITS INCLUDING INCREASED ENERGY SAVINGS RESULTING FROM INTEGRATED ENERGY AND GRID DATA ACQUISITION.

IMPROVE the reliability of instantaneous power demand by rapidly detecting critical peaks and curtailing loads or triggering alarms if specified thresholds are exceeded

MINIMIZE analysis time and expenses while improving the accuracy of recorded data

BENCHMARK similar facilities to compare and reduce energy consumption by setting usage standards

DEVELOP better energy cost allocation; the ability to assign energy costs to their source increases awareness of energy consumption

VERIFY energy bills of suppliers by creating more transparency for negotiating of energy contracts

AUTOMATE peak load analysis to detect and prevent costly peaks mainly for electricity, steam or gas demand

PLAN investments and energy-saving activities through detailed reporting

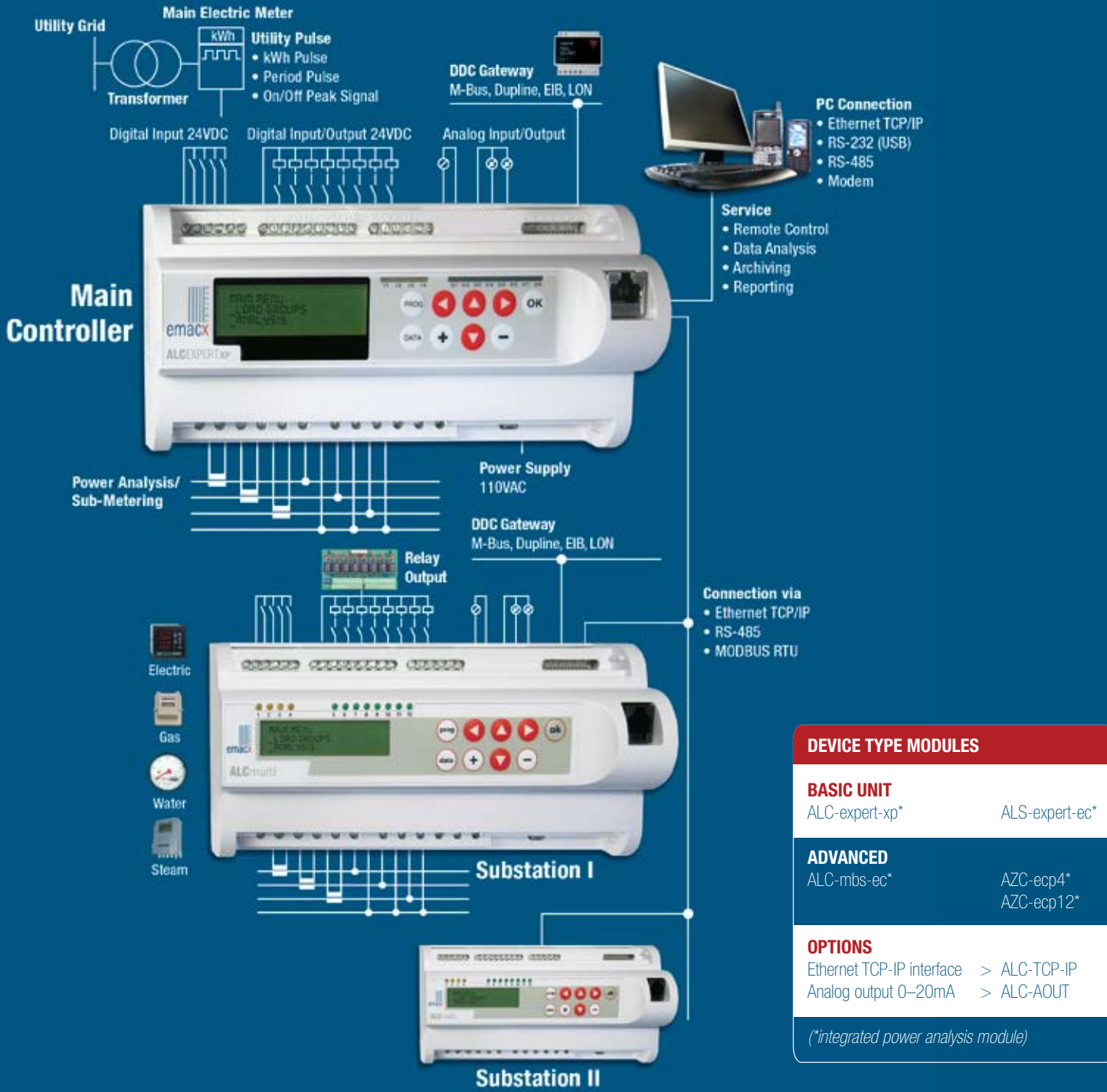
VALIDATE efficiency and sustainability of investments of energy-saving activities

DOCUMENT energy information for use with environmental regulations and improve energy usage

INCREASE the overall efficiency of buildings, the profitability of your power generation facilities through efficient use of diesel generators, cogeneration PLANTS, photovoltaic panels, and other alternative energy sources

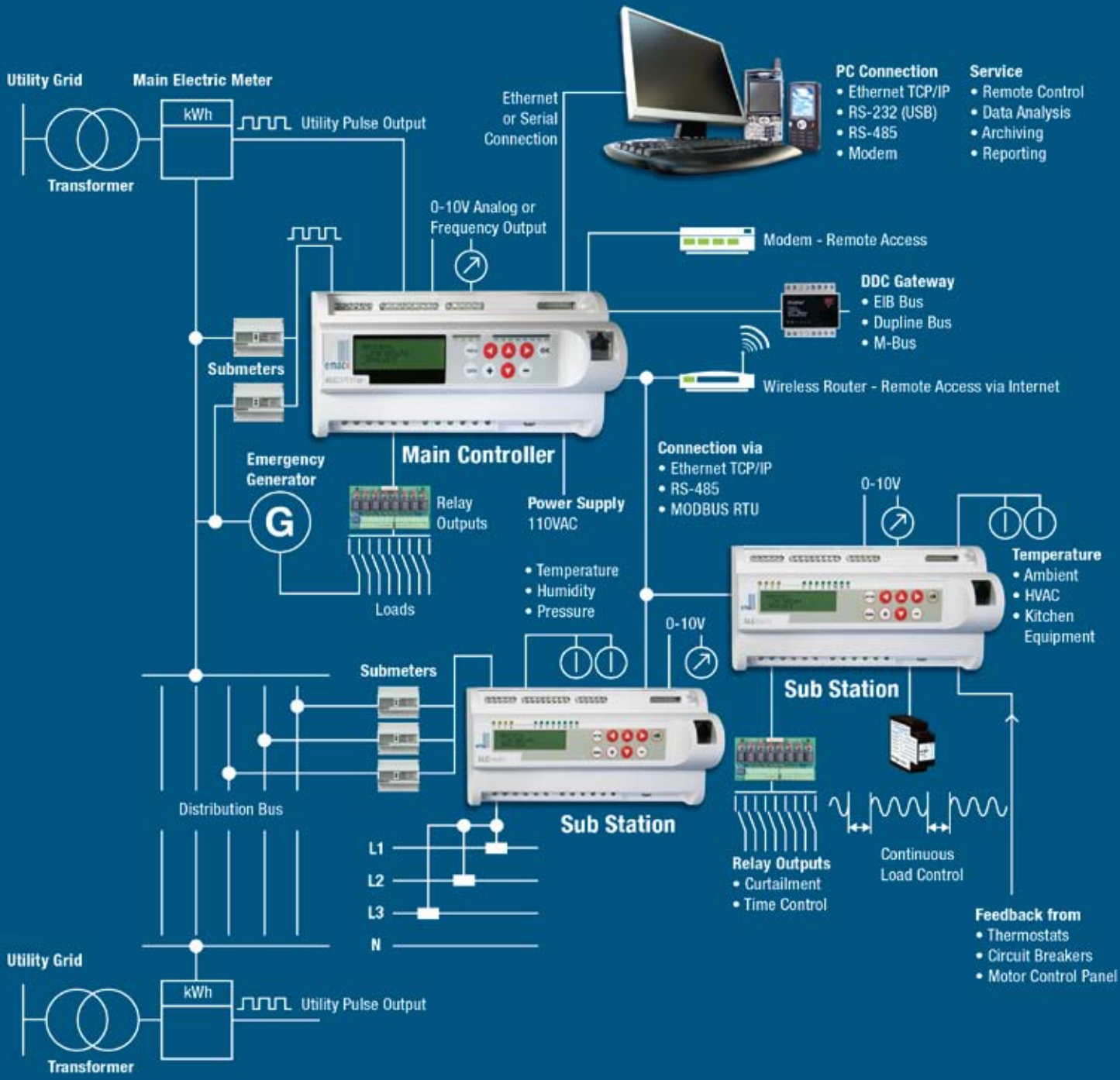


Schematic Circuit Diagram



DEVICE TYPE MODULES	
BASIC UNIT	
ALC-expert-xp*	ALS-expert-ec*
ADVANCED	
ALC-mbs-ec*	AZC-ecp4*
	AZC-ecp12*
OPTIONS	
Ethernet TCP-IP interface	> ALC-TCP-IP
Analog output 0–20mA	> ALC-AOUT
(*integrated power analysis module)	

System Architecture



- PC Connection**
- Ethernet TCP/IP
 - RS-232 (USB)
 - RS-485
 - Modem

- Service**
- Remote Control
 - Data Analysis
 - Archiving
 - Reporting

- DDC Gateway**
- EIB Bus
 - Dupline Bus
 - M-Bus

- Connection via**
- Ethernet TCP/IP
 - RS-485
 - MODBUS RTU

- Temperature**
- Ambient
 - HVAC
 - Kitchen Equipment

- Feedback from**
- Thermostats
 - Circuit Breakers
 - Motor Control Panel



Market Sectors

THE ALC-EXPERT WITH ITS MULTI-FUNCTIONALITY ALLOWS TO ADDRESS INDUSTRY-SPECIFIC REQUIREMENTS MORE EFFECTIVELY. PREREQUISITES FOR PEAK LOAD OPTIMIZATION AND DATA ACQUISITION SYSTEMS ARE VIRTUALLY THE SAME ACROSS ALL SECTORS.

HOSPITALITY INDUSTRY

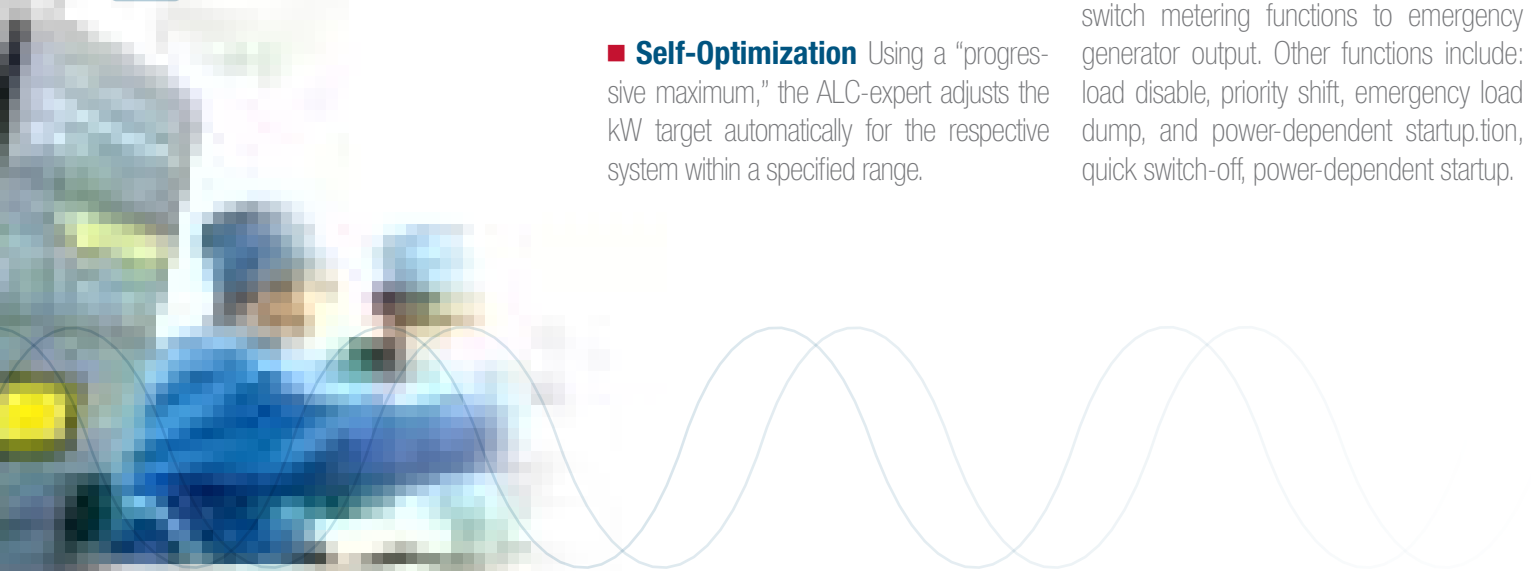
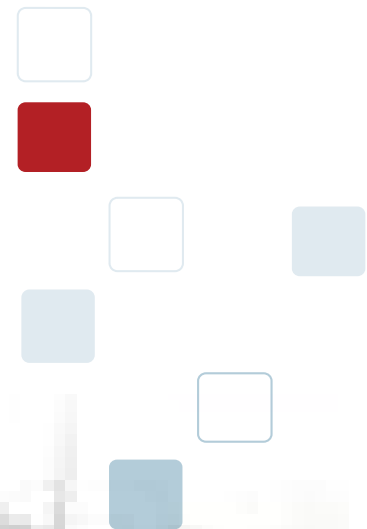
Hotels, Resorts, Restaurants, Casinos, etc.

HEALTH CARE INDUSTRY

Hospitals, Research Facilities, Long-Term Care Facilities, etc.

Both sectors are very similar and are characterized by substantial demand peaks mainly caused by the HVAC Systems and its associated equipment. Integrating the variable speed drives of air handlers, condenser water pumps, chill water pumps, as well as chillers makes a substantial contribution towards demand and energy savings. The ALC-expert's sophisticated dynamic trending control strategy based on constant recalculation of the demand characteristic curve performs curtailment without adverse impact of operations or comfort. Common functions of the ALC-expert used for those industries are:

- **Continuous Load Control** The Emacx Controller allows for frequency modulation and outputs of analog voltage (0-10mV) or current (2-20mA) signal for continuous load control for VFDs, chillers or valves. With analog signal modulation for instance chiller demand can be easily controlled either through a chilled water reset or external current limiting.
- **DDC Gateway** Easy integration into existing building management systems and other technology via Ethernet, LON, Dupline, Instabus EIB, and serial connections using RS-232 or RS-485 interfaces with Send Data functionality (ASCII or binary).
- **Emergency Power Mode** Control loads while running on emergency power; switch metering functions to emergency generator output. Other functions include: load disable, priority shift, emergency load dump, and power-dependent startup, quick switch-off, power-dependent startup.
- **Self-Optimization** Using a "progressive maximum," the ALC-expert adjusts the kW target automatically for the respective system within a specified range.





INDUSTRIAL MARKET

Pharmaceutical Plants, Food and Beverage Production, Warehouses, etc.

The industrial market is often characterized by processes that are controlled by loads that are extremely sensitive to curtailment / reduction or only a very few heavy duty loads are available for curtailment.

- **Auxiliary kW-Target Curve** Critical loads can be controlled by a second kW target curve offset by a specified percentage.
- **Utility Interval Setting** Utility intervals can be freely configured between 1 to 60 minutes.
- **Alarm Management** Critical loads can be controlled by a second kW target curve offset by a specified percentage.
- **Parameter Switching** Priorities and duty cycling times can be modified using manual inputs or integrated time clock functions for each individual connected load.



GENERAL FUNCTIONS

- **Synchronization of Utility Meter Pulse** Automatic detection of utility meter pulses, freely selectable billing interval of 15, 30, 45 or 60 minutes.
- **Integrated Alarm Notification** Alarm Notification for system alarms, meter alarms, out-of-range alarms, overload alerts, and others.
- **Load Definition / System Configuration** Each electrical load can be defined with a name and a nominal power rating as well as additional system/facility specific configuration options such as ISO curtailment, weekend/holiday operation, etc.
- **Manual Overrides** Normally open or closed contacts can be configured for manual override capabilities.
- **Curtailment Log** All load curtailments are recorded and logged with time and date stamp for start and stop.
- **Special Switch Clock Functions** Integrated annual switch clock function for each output for special event programming and/or tariff modification.





Additional functions

DATA ACQUISITION / DATA ANALYSIS

■ **Pulses** from utility meters (electricity, gas, water, steam) are recorded by digital inputs. Data is saved as daily, monthly, and annual load profiles and as numeric consumption values for display and analysis.

■ **Operating and Process Data** as well as error and alarm messages are recorded via digital inputs. Operating and process data are stored as daily values or in user-defined time windows from 1 to 60 minutes; error and alarm messages are saved with time and date stamps.

■ **Utility Grid and Power Analysis** for single and multi phase systems data such as voltage, cosPhi, active, apparent, and reactive power can be recorded. The data is stored as daily values or in user-defined time windows from 1 to 60 minutes.

■ **Analog values** such as temperature, humidity, fill levels, etc. can be recorded over two available analog inputs. Data can be sampled with a freely selectable resolution of 1 to 500 minutes.

MONITORING / CONTROL

■ **Recorded** consumption values in daily or annual usage load profiles can be automatically monitored to maintain preset thresholds..

■ **Meter Readings** such as average demand, current, voltage, etc. can be monitored at any time for minimum and

maximum values. Out-of-range values are saved with time and date stamp and can be linked to digital outputs for alarm notification.

■ **Switch Clock Functions** can control connected loads based on weekly or annual calendars for special days and events.

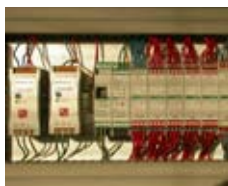
COMMUNICATION

■ **All models** of the ALC-expert feature two serial ports: (1) RS-232 for a direct connection to the PC via serial cable or modem and (1) RS-232/RS-485 for a bus connection to multiple data loggers or for integration of data loggers in an Emacx demand control system.

■ **All models** are equipped with an Eth-

ernet jack to connect the ALC-expert to a PC via standard TCP/IP protocol.

■ **Functions** are configurable via ALC-Visual, data can be synchronized automatically or manually, instantaneous measurement and calculated values can be shown in real-time, and all error/alarm messages or out-of-range alarms can be displayed on-screen or sent via e-mail.





Special features of the xp series

ADVANCED CONTROL FUNCTIONALITY Logic-based control functions from input devices such as thermostats, common alarm inputs, and error messages are available. Monitoring of analog signals or control loops can be set up based on submeters and totalizers.

SELECTABLE CONTROL ALGORITHMS A variety of control algorithms and energy trending functions can be selected: standard, linear, direct.

VARIABLE CYCLES Power-dependent modification of the switching ratios within a specified range can be set.

TOTALIZING UTILITY METERS Up to 8 utility meters can be totalized to control demand in a facility with multiple utility feeds

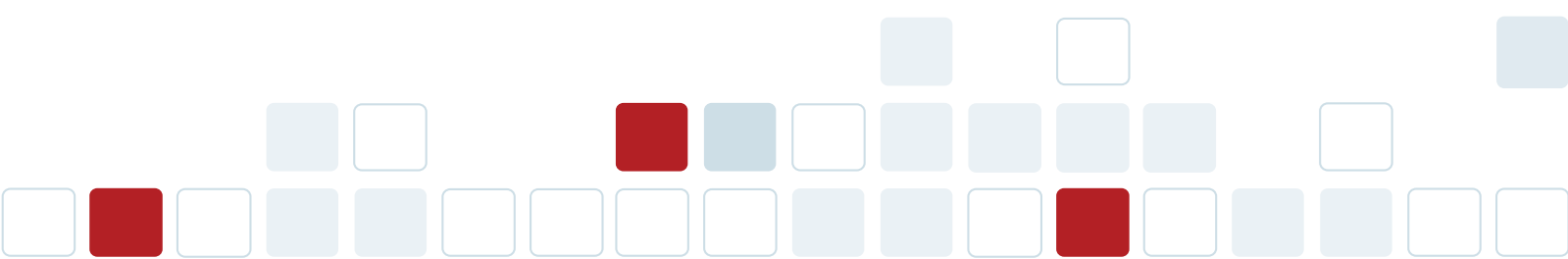
SCHEDULED OPTIMIZATION Demand control based on a time table using daily, monthly, and annual schedules (up to 96 events per day) can be performed.

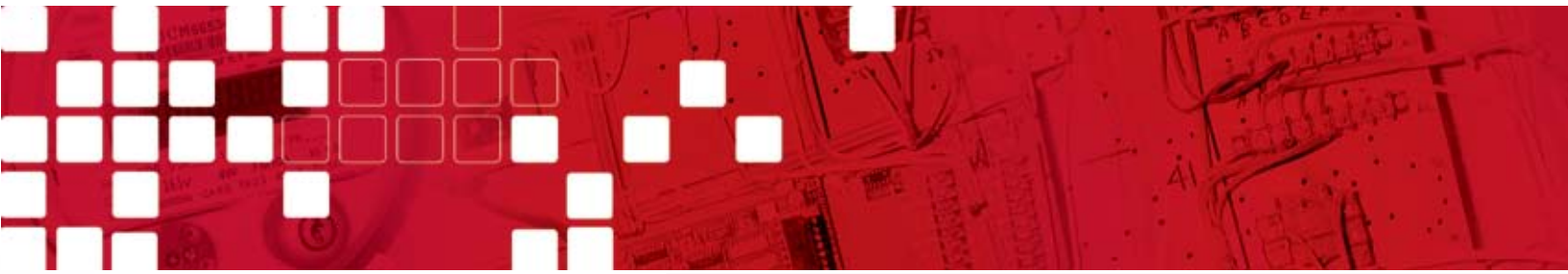
AUTOMATIC SAVINGS CALCULATION ALC-Visual automatically calculates energy savings based on consumption and recorded curtailment time.

AMPERAGE SAVINGS FUNCTION Curtails a load to reduce electrical current consumption based on specific, user-defined operating conditions



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Technical data / dimensioned drawing



- **Power supply** 110 VAC @ 60 Hz
- **Housing** ABS plastic casing
- **Dimensions:** AH x W x D: 3.95" x 8.25" x 3.05"
- **Protection class** NEMA 1 (IP 20)
- **Operating temp** 32 - 104° F (0 - 40°)
- **Impact standards** ENV 50140, ENV 50204, EN 61000-4-4, ENV 50141
- **RFI suppression** EN 50081-1
- **Measurement Method** Four-quadrant measurement of single/three phase or 4-conductor networks, 5A converter, 35A direct, 3x230V/400VAC 6
- **Accuracy** Class 1 according to IEC 1036
- **Digital in/outputs** 8 x output 24 VDC, max. 25 mA; input 24 VDC, 10 mA
- **Digital inputs** 4 x 24 VDC, 10 mA, input delay 10 ms (25 Hz)
- **Analog inputs** 2 x 0 - 10V, 10-bit (0/4-20 mA over 500 ohms)
- **Ports** S1=RS-232; S2=RS-485 (RS-232 jumper)
- **Memory** 1MB RAM (w/ battery backup); 32KB EEPROM
- **Keypad** 9-button keypad
- **Weight** 2.10 lbs
- **Power loss recovery** Data backup and automatic restart
- **Hardware clock** 30-day battery backup; automatic DST switchover
- **Power consumption** 9 VA

