

norm**NEN-EN 15500**Electronic individual zone control
equipment

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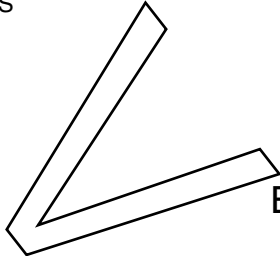
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Voorbeeld
Preview

March 2006

ICS



English Version

Electronic individual zone control equipment

Régulateur électronique de zone pour le chauffage

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If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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Foreword

This document (prEN 15500:2006) has been prepared by Technical Committee CEN/TC 247 "Building Automation, Controls and Building Management", the secretariat of which is held by SNV.

This document is currently submitted to the CEN Enquiry.

This prEN 15500 is part of a series of European standards for a series of product for electronic individual zone control equipment applications for mechanical building services. This standard covers electronic individual zone control equipment for heating, ventilation and air conditioning applications in residential and non residential buildings.

No existing European standard is superseded.

Preview

prEN 15500:2006

Introduction

Equipment to control the heating, ventilation and air-conditioning (HVAC) in a building according to the actual room or zone energy demand, is necessary in order to reduce the consumption of energy and improve the quality of the air. HVAC installations should, for the purpose of energy conservation and guaranteeing indoor environmental comfort, be equipped with automatic zone control equipment. Under the term “automatic zone control equipment” is to be understood the functional unit comprising controller, actuator and sensor.

The zone control equipment controls the comfort of the environment by controlling physical variables such as temperature, humidity, air-quality or air-flow in accordance with occupancy and user requirements.

This standard, which is valid for applications in all domestic and non-domestic buildings, conforms to the requirements and objectives of the interpretative documents “Energy Economy and Heat Retention” and “Hygiene, Health and the Environment” relating to the Construction Products Directive (89/106/EEC) and the preparations for a standardisation mandate from the European Commission are on-going.

1 Scope

The purpose of this standard is to specify the applications, functionality set and application performance for electronic individual zone control equipment, for

- Heating for Electrical and Hot water applications
- Fan coil and Induction Units applications
- VAV, CAV and Chilled Ceiling applications.

This standard applies specifically to individual zone control equipment for maintaining temperature, humidity and air flow as a function of occupancy and demand operated with auxiliary electrical energy.

Information required for the operation of the equipment may be processed using either analogue or digital techniques or a combination of both. Safety requirements remain unaffected by this standard.

The control equipment may or may not be connected to a data-network however communications aspects are not covered by this standard.

2 Normative References

This standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 60529	Degrees of electrical and mechanical protection provided by enclosures (IP code)
EN 60947-1	Low voltage switch gear and control gear
EN 60730-1	Automatic electrical controls for household and similar use - Part 1: General requirements
EN 60730-2-1	Automatic electrical controls for household and similar use - Part 2 : Particular requirements for electrical controls for household equipment.
EN 60730-2-9	Automatic electrical controls for household and similar use. Part 2: Requirements for temperature sensing controller
EN 50081-1	Electromagnetic compatibility - Generic emission standard Part1: Residential, commercial and light industry
EN 50082-1	Electromagnetic compatibility - Generic immunity standard Part 1. Residential, commercial and light industry
EN 61010	Safety requirements for electrical equipment for measurement, control and laboratory use
EN 60950	Safety of information technology equipment, including electrical business equipment
ISO 5167-1	Measurement of fluid flow in pipes

3 Terms and definitions

This clause presents the vocabulary used in this standard. The terms and definitions listed in this standard but defined by other relevant EN ISO/IEC Standards are repeated below for convenience in most cases.

NOTE Other language versions may contain an alphabetical index in National Annexes.

For the purposes of this standard, the following terms and definitions apply.

3.1 Individual Zone Control

This is defined as the control of the physical variables in an area of a building with its own individual controller.

3.2 Controller Types

3.2.1 Fixed-Function Controller

This is a controller where the manufacturer supplies one or a set of control functions for a specific application.

3.2.2 Configurable and Programmable Controller

This is a controller where the internal control structure can be changed (i.e. the way in which inputs, outputs and control functions are combined) in order to achieve the desired control strategy.

3.3 Application Groups

Individual zone control equipment for heating is subdivided into the following application groups : Central Heating, Direct Heating, Storage System

The following sections summarise the applications covered by this standard.

3.3.1 Central Heating

Central heating is defined as a single heat source with multiple emission units in one or several zones.

3.3.2 Direct Heating

Direct Heating is defined as the combined production and emission of heat. The heat source can be electric, gas, oil, or other fuel sources. The heat emitter can be a panel radiator, convector, floor or ceiling heating.

3.3.3 Storage System (for direct or central heating)

Storage Heating is defined as a heat emission unit which stores energy produced during off-peak periods at a reduced price. The heater (radiator, floor) has a large mass in order to store heat energy. Heat storage and demand may be indoor and/or outdoor temperature controlled.

3.4 Building & Zone Types

3.4.1 Building Types

Building Types can be :

Domestic :

- single family
- multiple family

Non-domestic :

- intended to provide continuous occupancy
- intended to provide non-continuous occupancy

3.4.2 Zone Types

Zone Types can be :

- 1) Zones intended to provide occupancy or maintained conditions for 24 hours :

- Examples are :
- hospital wards
 - hotel reception area
 - airport concourses
 - police stations
 - museum exhibition area

- 2) Zones intended to provide non-continuous occupancy or maintained conditions for 24 hours :

- i) Regular occupancy/maintained conditions. Examples are :

- shops
- offices (open-plan)

- ii) Intermittent occupancy/maintained conditions. Examples are :

- hotel rooms
- conference rooms
- offices (individual)

3.5 Operating Modes

This section describes the possible modes of operation of the zone control equipment.

The operating modes can be described as follows:

Comfort Comfort is the operating mode for an occupied room. The room state is in the comfort range with regard to temperature and humidity, air quality and movement, brightness and glare protection or solar radiation and noise level.

Pre Comfort Pre-Comfort is an energy-saving operating mode for the room to quickly reach the comfort range as the final room state upon changing to the Comfort operating mode. In the Pre-Comfort operating mode, the control uses setpoints that can deviate from the Comfort setpoints. Changeover between Pre-comfort and Comfort normally occurs via presence detectors or buttons, but also via a room occupancy scheduler program

Stand-by The mode of operation in which the set points are raised or lowered from the comfort set points to widen the energy-free band.

Economy Economy is an energy-saving operating mode for a room that does not need to be in the Comfort operating mode for an extended period of time. In the Economy operating mode, the control uses setpoints that can deviate from the Pre-comfort and Comfort setpoints. Changeover to the Economy operating mode occurs via a scheduler program.

Frost protection The mode of operation whereby a fixed low temperature set point is maintained in order to avoid frost.

Building protection A mode of protection, e.g. building fabric protection, in a low heating or high cooling temperature set point is used.

Override A mode where outputs can be overridden to a predetermined state for a limited pre-determined period (e.g. until the next programme time).

OFF (switched off) A mode of operation where control and interlock functions are not operational.

Holiday A mode where a time programme is used to control a constant room temperature for a pre-determined period.

Tariff optimisation A mode of operation to adjust the room temperature according to the tariff rate signal from the electrical supplier.

The operating modes of the zone controller can be either *manual* or *automatic*:

Manual The mode of operation when significant control functions is overridden by the user.

Automatic The mode of operation when significant control functions are not overridden by the user.

3.6 Input and Output Devices

3.6.1 Input Devices / Sensors

Sensors (also referred to as detectors) serve the purpose of measuring physical parameters such as temperature, humidity, air-quality, air-flow or occupancy. The sensor is incorporated into housing suitable for mounting and can be regarded as a functional unit which produces a signal that can be evaluated in correspondence with the quantity measured.

3.6.2 Output Devices / Actuators

Actuators serve the purpose of changing mass-, volume- and energy-flows. The actuator can be regarded as functional unit which carries out an appropriate change according to an appropriately evaluated signal.

4 Abbreviations

For the purposes of this Part 2 and Part 3 of this standard, the following abbreviations and acronyms apply.

ASP	Actual Setpoint
BMS	Building Management System
CA	Control Accuracy
CA _{ss}	Control Accuracy steady state
CA _{ss}	Control Accuracy in steady state
CA _{ts}	Control Accuracy transient state
CA _{ts}	Control Accuracy in transient state
CAV	Constant Air Volume
CCS	Chilled Ceiling System
CP	Control Parameters
CSA	Control Setpoint Accuracy
CSA _{ss}	Control Setpoint Accuracy steady state
CSA _{ss}	Control to Setpoint Accuracy in steady state
CSA _{ts}	Control Setpoint Accuracy transient state
CSA _{ts}	Control to Setpoint Accuracy in transient state
EC	Electric Convectector
ECH	Electric Ceiling Heating
EFH	Electric Floor Heating
FCU-2P	Fan Coil Unit system - 2 Pipes
FCU-2P2W	Fan Coil Unit system - 2 Pipes 2 Wires
FCU-4P	Fan Coil Unit system - 4 pipes
h	Hours
HS	Heating system
HVAC	Heating Ventilating and Air Conditioning
IEEE	Institute of Electrical and Electronics Engineers
IEP	Index of Energy Price
K	Degree Kelvin
NTC	Negative Thermal Coefficient
OM	Operating Mode
OP	Other Parameters
OS	Output Signal
P-Band	Proportional Band

PES	Price energy Signal
PI	Proportional plus Integral
PID	Proportional plus Integral plus Derivative
s	Seconds
SIMTEST	SIMulation models for TESTing Control systems HVAC application.
SP	Setpoint
SPA	Setpoint Adjustment
T1	Time 1 (End of transient test period)
T2	Time 2 (End of steady state test period)
TCAC	Temperature Control Accuracy
TDP	Dewpoint temperature
TS	Surface temperature
TZ	Zone temperature
V	Air (volume) flow
VAV	Variable Air Volume
VAV	Variable Air Volume system
Vmax	Maximum air (volume) flow limit
Vmin	Minimum air (volume) flow limit
Vnom	Nominal flow, i.e. the maximum air flow that a VAV box can handle as specified by the manufacturer
WFH	Water Floor Heating

5 Requirements

5.1 General

5.1.1 Functional Objective

The objective of electronic individual zone control equipment is to save energy and achieve acceptable levels of hygiene, health and comfort, by performing the following primary functions:

- Control the zone variables by influencing the energy supply source (e.g. hot/chilled fluid, electrical energy, air volume,...)
- Minimise the energy supplied to the zone (e.g. operating modes: comfort, economy, etc.).
- Minimise running cost according to the price of energy.

5.1.2 Minimum Operating Mode

To minimise energy consumption, heating zone controllers shall at least include the following three operating modes, as defined in Section 3.5 « Operating modes » ::

- Comfort
- Stand-by or Economy
- Frost Protection or Building Protection

5.1.3 Control Equipment Functionality

The table below describes the functions which the controller may be capable of carrying out, and if they have any significant benefit on energy savings, air quality, comfort and hygiene / health.

5.1.4 Controller functions

The Table 1 describes the functions which the controller may be capable of carrying out, and if they have any significant benefit on energy savings, air quality, comfort and hygiene / health.

Table 1 - Controller functions

Local Functions :	Heating				Fan-Coil				VAV			
	A	B	C	D	A	B	C	D	A	B	C	D
Control to set point	x		x		x		x		x		x	x
Set point limitation	x		x	x	x		x	x	x		x	x
Set point adjustment			x	x			x	x			x	x
Operating time override			x				x				x	x
Window contact status	x				x				x			
Demand controlled ventilation	x	x	x			x			x	x	x	x
Energy Free Band	x		x		x		x		x		x	
Presence Sensing	x		x		x		x		x		x	x
Occupancy Signal (Button)	x		x		x		x		x		x	x

Network or Local Functions :	Heating				Fan-Coil				VAV			
	A	B	C	D	A	B	C	D	A	B	C	D
Time Scheduling	x		x		x		x		x		x	
Optimum Start and/or Stop	x		x		x		x		x		x	
Summer/Winter Compensation	x		x		x		x	x	x		x	
Limit-Value Monitoring	x	x	x		x	x	x		x		x	
Energy Demand Request	x				x				x			
Status Monitoring	x				x				x			
Free-Cooling	x				x				x			
Morning-Boost			x				x					
Summer/Winter Changeover	x		x		x		x					
Air Flush		x	x									

A = Energy saving

B = Air Quality

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