

**Öppen datakommunikation för byggnads-
automation, styrning och teknisk byggnadsdrift –
Protokoll styr- och reglernätverk –
Del 2: Kommunikation på partvinnad ledning**

**Open Data Communication in Building
Automation, Controls and Building
Management – Control Network Protocol –
Part 2: Twisted Pair Communication**

ICS 97.120

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Europastandarden EN 14908-2:2005 gäller som svensk standard. Standarden har tagits fram av CEN/TC 247, *Building automation, controls and building management*. Detta dokument innehåller den officiella engelska språkversionen av EN 14908-2:2005.

Denna standard beskriver den fysiska partvinnade, fria topologi (FTT-10) kanalen till styr- och regler-nätverket som behandlas i del 1 av EN 14908. Kanalen stöder kommunikation med hastigheten 78,125 kbps mellan olika noder. Dokumentet beskriver lager 1 (OSI layer 1) inklusive koppling till MAC lagret och till det fysiska mediet.

EN 14908 ersätter ENV 13152-2 då EIB, Batibus och EHS ingår som grund i KNX och de är numera utbrutna ur den ursprungliga standarden.

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Supersedes ENV 13154-2:1998

English Version

**Open Data Communication in Building Automation, Controls and
Building Management - Control Network Protocol - Part 2:
Twisted Pair Communication**

Réseau ouvert de communication de données pour
l'automatisation, la régulation et la gestion techniques du
bâtiment - Protocole de réseau pour le bâtiment - Partie 2 :
Communications par paires torsadées

Firmenneutrale Datenkommunikation für die
Gebäudeautomation und Gebäudemanagement -
Gebäudedatennetzprotokoll - Teil 2: Kommunikation über
paarig verdrehte Leitungen

This European Standard was approved by CEN on 11 August 2005.

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. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.



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Foreword

This European Standard (EN 14908-2:2005) has been prepared by CEN /TC 247, "Building Automation, Controls and Building Management", the secretariat of which is held by SNV.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 2006, and conflicting national standards shall be withdrawn at the latest by April 2006.

This European Standard supersedes ENV 13154—2:1998.

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This European Standard is part of a series of standards for open data transmission in building automation, control and in building management systems. The content of this European Standard covers the data communications used for management, automation/control and field functions.

EN 14908-2 is part of a series of European Standards under the general title *Control Network Protocol (CNP)*, which comprises the following parts:

Part 1: *Protocol Stack*¹

Part 2: *Twisted Pair Communication*¹

Part 3: *Power Line Channel Specification*¹

Part 4: *IP-Communication*¹

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

¹ Under preparation.

¹ Under preparation.

EN 14908-2:2005 (E)

Introduction

This European Standard has been prepared to provide mechanisms through which various vendors of building automation, control, and building management systems may exchange information in a standardised way. It defines communication capabilities.

This European Standard is to be used by all involved in design, manufacture, engineering, installation and commissioning activities.

This European Standard has been made in response to the essential requirements of the Constructive Products Directive.

1 Scope

This European Standard specifies the control network protocol (CNP) free-topology twisted-pair channel and serves as a companion European Standard to prEN14908-1. The channel supports communication at 78,125 kbps between multiple nodes, each of which consists of a transceiver, a protocol processor, an application processor, a power supply, and application electronics.

This European Standard covers the complete physical layer (OSI Layer 1), including the interface to the Media Access Control (MAC) sub-layer and the interface to the medium. Parameters that are controlled by other layers but control the operation of the physical layer are also specified.

2 Normative References

The following referenced documents are indispensable for the application of this European Standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 14908-1:2005, *Open Data Communication in Building Automation, Controls and Building Management - Building Network Protocol - Part 1: Protocol Stack*.

EN 50173-1, *Information technology - Generic cabling systems- Part 1: General requirements and office areas*

3 Network Overview

The CNP free-topology twisted-pair channel supports up to 128 nodes on a single network segment with an optional link power source that supplies DC power to the nodes on the network. The channel is specified to support free-topology wiring, and will accommodate bus, star, loop, or any combination of these topologies. The total network length and number of nodes may be extended by use of CNP channel physical layer repeaters, or CNP compliant routers. The channel data rate is 78,125 kbps. Nodes can be either locally powered or link powered. A link-powered node derives its power from the network. The power is delivered on the same two conductors that carry data. Nodes are polarity-insensitive with respect to data as well as DC power. A locally powered node derives its power from a local source. The data is transmitted using Differential Manchester encoding, which is polarity-insensitive.

4 System Specifications

4.1 General Aspects

This section specifies the cable type used, terminations required with bus or free topology, maximum node counts and distances for link and locally powered schemes, and the maximum steady state power that can be drawn from the link power supply.

4.2 Cable

The cable shall conform to EN 50173-1.

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4.3 Topology

4.3.1 Free or Bus Topology

The network may use either a singly-terminated free topology or a doubly-terminated bus topology.

4.3.2 Repeater

Two network segments may be interconnected with a channel physical layer repeater. No more than one physical layer repeater shall be in a path between any two nodes on a network. Physical layer repeaters shall not be interconnected in such a way as to create a loop.

Each port of a physical layer repeater shall meet the specifications stated in 6.2, 6.3.3, and 6.4. The delay through the repeater shall not exceed 36 μ s.

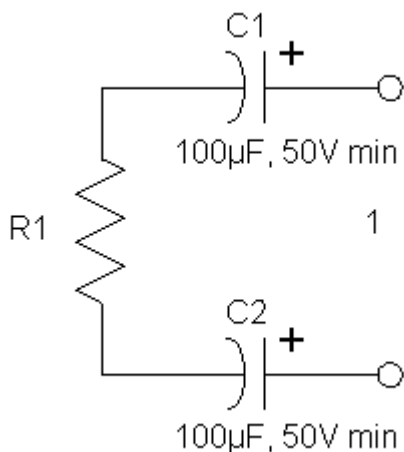
4.4 Cable Termination

4.4.1 Free-topology Segment

A free-topology segment shall have a single termination. If the segment is locally powered, an RC network as shown in Figure 1 shall be used, with $R1 = 52,3 \Omega \pm 1 \%$, 1/8 W. The termination may be located anywhere on the segment. If the segment is link-powered, the termination shall be provided by the link power source. See Figure 5. The link power source and termination may be located anywhere on the segment.

4.4.2 Bus Topology Segment

A bus topology segment shall have two terminations, one at each end of the bus. If the segment is locally powered, an RC network as shown in Figure 1 shall be used, with $R1 = 105 \Omega \pm 1 \%$, 1/8 W at each end. If the segment is link-powered, the link power source shall provide one termination. See Figure 5. The other termination shall be an RC network as shown in Figure 1, with $R1 = 105 \Omega \pm 1 \%$, 1/8 W.



Key
1 Network Connection

Figure 1 — Termination

4.5 Segment Configuration

A free-topology twisted-pair channel shall support up to 128 link-powered or 64 locally-powered nodes at a maximum bit error rate of 1 in 100 000. Both types of nodes shall be supported on a given segment, provided the following constraint is met:

$$(1 \times \text{number of link powered nodes}) + (2 \times \text{number of locally powered nodes}) \leq 128$$

Table 1 shows the maximum bus length for a bus-topology segment.

Table 2 shows the maximum node-to-node distance and maximum wire length for a free-topology segment. The distance from each node to each of the other nodes and to the link power source shall not exceed the maximum node-to-node distance. If multiple paths exist, e.g., a loop topology, then the longest path shall be used for the calculations. The maximum wire length is the total amount of wire connected to a network segment.

Table 1 — Bus-Topology Distance Specifications

Maximum Bus Length	Maximum Stub Length	Units
600	3	meters

Table 2 — Topology Distance Specifications

Maximum Node-to-node Distance	Maximum Total Wire length	Units
250	450	metres

4.6 Power Specifications

The sum of the steady-state power drawn by all nodes on a segment shall not exceed 36,5 watts. For each branch, the sum of the products of each node's distance multiplied by that node's power shall not exceed a constant:

$$P_1 \times d_1 + P_2 \times d_2 + P_3 \times d_3 + \dots \leq C \times \alpha \quad (1)$$

where

- C is a constant, dependent on wire type, taking into account manufacturing tolerance and all other variations except wire temperature;
- $C = 1,9 \times 10^3$ watt-meters;
- P_i = Node power, i.e., the maximum steady-state power drawn by node 'i' from the network, in watts;
- d_i = Node distance, i.e., the distance of node 'i' from the link power source, in meters;
- $\alpha = 1/(1 + 0,00393 * (\text{temp} - 25^\circ\text{C}))$, accounting for average wire temperature.

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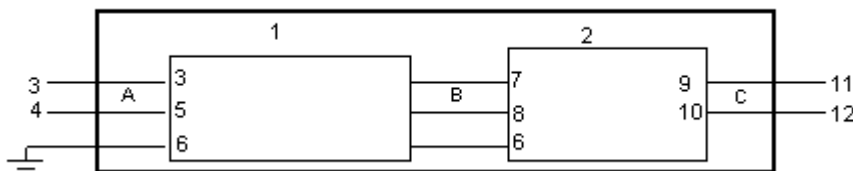
5 Link Power

5.1 General

A link-powered node derives its power from the network. The power is delivered on the same two conductors that carry data.

5.2 Source

The link power source shall consist of a passive coupler together with a power supply having special attributes. The requirements for the power supply for proper system operation include its start-up behaviour, tolerance to direct shorts across its output, and output voltage regulation. A schematic for the coupler is also included. The combination coupler/power supply block diagram is shown in Figure 2. Any deviations from the power supply requirements and coupler schematic (Figure 5) are allowed provided that the link power source design is electrically equivalent.



Key

- 1 Power Supply
- 2 Coupler
- 3 Line
- 4 Input
- 5 Neutral
- 6 Earth
- 7 Vin +
- 8 Vin -
- 9 Net +
- 10 Net -
- 11 Network
- 12 Output

Figure 2 — Link Power Source

The differential DC output voltage of the link power source shall be 41,0 VDC – 42,4 VDC over full operating conditions. Under normal (non-fault) conditions, the link power source shall "centre" the output voltage with respect to earth ground, resulting in +21 V and –21 V outputs at "Net+" and "Net-" respectively. The link power source shall recover after a continuous direct short across the output and shall properly restart the link powered network.

An earth reference terminal is required if the coupler is not grounded via the power supply.

5.3 Power Supply Requirements

Unless otherwise specified, the power supply specifications in Table 3 shall be met over all combinations of the following conditions:

- Specified coupling circuit connected
- Line input voltage over full range per specification
- Network output load = 0 to 1,5 DC amperes

Table 3 — Power Supply Requirements

Description	Conditions	Specification
Line input voltage & indicator	<ul style="list-style-type: none"> • Measured at "A" (see Figure 2) 	Line voltage as required by application environment. Input Power Applied indicator required - LED or equivalent.
Output voltage	<ul style="list-style-type: none"> • Measured at "B" (see Figure 2) 	42,4 VDC maximum 42,08 VDC minimum
Output voltage regulation response	<ul style="list-style-type: none"> • Measured at "B" • 50 % step change in load 	Output voltage must recover to within 1 % of its final value in less than 1ms of step change in load.
Output reference	<ul style="list-style-type: none"> • Measured at "B" • Coupling circuit disconnected 	Floating with respect to earth.
Output ripple voltage (Differential)	<ul style="list-style-type: none"> • Measured at "B" 	Reference Figure 2.
Spike noise (Differential)	<ul style="list-style-type: none"> • Measured at "B" • 50 MHz bandwidth 	400 mV peak-to-peak maximum.
Output common-mode noise	<ul style="list-style-type: none"> • Measured at "B" with respect to earth 	100 mV peak-to-peak maximum.
Continuous output current capability	<ul style="list-style-type: none"> • Measured at "B" 	0 - 1,5 ADC
Output start-up interval behaviour	<ul style="list-style-type: none"> • Start-up or recovery from output short circuit or over-current fault • Measured at "B" 	Reference Figure 4.
Short circuit output protection	<ul style="list-style-type: none"> • Continuous short circuit at output for any duration 	Must recover after fault is cleared according to "Output start-up interval behaviour" specification.
Single fault tolerance	<ul style="list-style-type: none"> • Any single component failure as open or short • Measured at "B" 	"Vin+" - "Vin-" ≤ 42,4V. "Vin+" to earth ≤ 42,4V. "Vin-" to earth ≤ 42,4V.