Passenger Information System

DOT with LED Information Board

DOT with LED information board IT D4.83A

DESCRIPTION OF EQUIPMENT

DOT-LED information board is electronic equipment designed for visualising of alphanumeric texts by means of matrix of electromagnetic visual elements — DOTs and simultaneously by means of LED diodes matrix.

The diameter of a **DOT element** is **10 mm** and the diameter of a **LED diode** is **3 mm**.

LED diode is integrated into each DOT element. We will refer these two elements together as DOT-LED hereinafter.

Information board has the following size of the display surface **19 rows x 112 columns**

The board is equipped with character fonts according to Table 1. Alphanumeric characters are displayed proportionally in 1 to 2 rows with the partial or complete diacritical marks.

The cabinet of the information board is made of steel sheets with surface finish. In the front part is has a view port of compound glass. The above-mentioned type of information board is controlled with the **on-board computer** by means of **CAN bus.** The electronics of the information board consists of the visual modules, i.e. printed circuit boards (PCB) with matrices of DOT-LED visual elements, PCB with electronic circuits of the control microcomputer with one additional module, which implements the galvanically isolated communication CAN interface. Then inside the cabinet there is the connecting PCB with terminal boards and safety elements.CANNON 9 M and CANNON 9 F connectors for connection of CAN bus (which connects the information board with the control on board computer) are at the side of the information board. The supply conductors and central reset conductors are connected to the information board through the holes with penetrations. The fixing holes are located at the sides of the cabinet (for 4 M6 bolts); they are used to fix at a vehicle or at inside surfaces of buildings. The editor operated on a PC computer is used to create the database of the displayed signs. The formed database is loaded by the RS232 bus the control on board computer of Unicontrols, which provides the further transport to the information board by the CAN bus. One can use the RS232 cable to connect the PC with the control on-board computer of Unicontrols.

Functional characteristics

Information board enables two main functions. First is loading of the database files which were created by a personal computer of PC type and storing of them into the FLASH memory of the control microcomputer of the information board and second is the function of receipt of control characters from the control on-board computer and visual presentation of the

data corre-sponding to it, i.e. the appropriate alphanumerical text, of the display surface of the board. Entry of data (processed into an appropriate format at a PC type computer) into the memory of information board (i.e. alphanumerical signs) is performed by the CAN bus. After the receipt the information board will process them and store them into the FLASH type memory. This is the alphanumerical signs fonts database and the alphanumerical signs database. The communication upon the database files transfer is carried out in both directions. The characters, which are received via the CAN bus from the on-board control computer, are analysed in the control microcomputer of the information board. After the evaluation the control microcomputer using the power circuits will perform the rotation of DOT-LED video elements so as the information board will display alphanumerical characters and pictograms. Information boards presents alphanumerical text at the whole display surface of an information board in various graphic layouts; one can use some of 16 types of alphanumerical characters fonts (including pictograms). The control microcomputer of the information board communicates with the control on-board computer in both directions. In addition to the receipt of the control characters it confirms the correctness of the received control characters (data), transfers information about the board operation errors etc. The central reset is physically implemented with 2 conductors, which are opically separated from the control microcomputer of the information board. The signal induces RESET of the microprocessor and initialisation of the programme from the very beginning, including connection establishment via the CAN bus.

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BASIC FUNCTIONS

Information board allows:

- Data transfer (i.e. receipt and transmission) via the CAN bus, loading of the signs database via the CAN bus
- Graphical presentation of one-row or two-row alphanumerical texts or pictograms, which corresponds to the control characters transmitted from the control on board computer.

OPERATING CONDITIONS

This equipment is designed for continuous operation in the mass transit vehicles (i.e. buses, trolleybuses, trams, trains, etc.) in the following environment:

- Operating temperature range: (from -25 to +45)°C, class T1 according to EN 50 155.
  Note: The surface temperature of the DOT-LED visual elements exposed the direct solar radiation, max. 70°C
- Non-operating temperature range: (from -40 to +70)°C
- Relative air humidity must not exceed 90 %
- Absolute air humidity must not exceed 27 g/m^3
  (within the overall range of operating temperatures steam condensation is not allowed)
- Air pressure: (86 to 106) kPa
- Working environment: free of aggressive gases and steam

TECHNICAL PARAMETERS

Dimensions	For type D 4.83.a 1430 (1460) x 265 x 55 mm
Weight	25 kg
Supply voltage and current	Supply voltage of electronics is + 24V - 30% + 25%, max. 2,5A
Number of DOT-LED elements	2128
Operation	Operating position: Vertical
Type of operation:	Continuous (switching off during operation is allowed).

Note: Connection to the supply voltage initialises the reset, i.e. display surface rotation into yellow and black.

Life time	10 years of continuous operation
This does not concern electromagnetic DOT elements.	100 million overturning is guaranteed for them.
Version, protection degree	The equipment is produced in the so-called standard version in compliance with ČSN 30 4002.
Protection degree:	IP 54 at the front side
	IP 52 at the other sides

MECHANICAL PARAMETERS

Vibration resistance:	To ČSN 34 5613. The equipment is resistant against the vibration frequency of 50 Hz with the amplitude of 0.5 mm and the multiple of gravity acceleration of 5 g for 8 hours.
Shock resistance:	To ČSN 34 5613. The equipment is resistant against the shocks of 10 000 impacts with the acceleration of 10 g.

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Individual blows impacts resistance:	To ČSN 34 5791. Equipment is resistant against the individual impacts of 15 g.
Electromagnetic compatibility	Emission to ČSN EN 50 081-1 (class B), ČSN EN 55022
	Resistance to ČSN EN 50 082-2, IEC 801-3, IEC 801-4
Type plate	Contains the main technical parameters, type designation and serial number

SYSTEM INFORMATION

Connecting points:	WAGO terminal clips are located at the connecting PCB.
Possibility to connect a bus	CAN bus (CANNON 9 pin connector)
Time of control signals transfer between the control on-board computer and the information board:	Max. 4 sec
Length of the connecting shielded cable of the RS232 serial link to connect the control on-board computer with the PC type computer (when loading of database)	Max. 15 m
The time of transfer of the data files with the database of alphanumerical signs from PC via the control on-board computer to the information board:	Max. 5 min
Storage capacity:	256 Kbytes with a standard version
(loading of at least 2000 alphanumerical texts displayable on the information board is available).	
The time of storage of the data files with the databases of alphanumerical signs in the information board with switched off power supply	Min. 10 years

Types of fonts:

The used types of fonts are specified in Table 1.

Font metric	Letter type	Diacritical marks	Line thickness	Note
7 x 5	Small	Partial	1	
8 x 5	Small	Partial	1	
8 x 6	Small		1, in Y-2 axis	Numeral
8 x 7	Small	Partial	1, in Y-2 axis	
9 x 5	Small	Full	1	
9 x 7	English type	Full	1, in Y-2 axis	
10 x 6	English type	Full	1, in Y-2 axis	Interval 1 col.
10 x 6	English type	Full	1, in Y-2 axis	Interval 2 col.
12 x 6	Capital, bold		2	Numeral
16 x 7	Capital, bold	Full	2	
16 x 8	Capital, bold		2	Numeral
19 x 8	Capital, bold		3	Numeral
19 x 9	Capital, bold	Full	2	
19 x 9	Capital, bold	Full	3	
16 x 28	Pictogram			
19 x 28	Pictogram			
The types of fonts can be changed to order				

Form of display targets:	Octagonal or circular (with stop
Colour of visual targets:	Standard yellow To order - white, green, orange, red, gold

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LED Information Board

LED information board D4L.01A, D4L.02A, D4L.03A

DESCRIPTION OF EQUIPMENT

General

LED information board is electronic equipment that comprises 1 to 8 display modules consisting of 1 or 2 rows. Each display module contains 8 x 32 light dots. The light dot diameter is 5 mm. There are several types of LED information boards in the manufacturing programme.

One-row information boards D4L.01A and D4L.03A comprise 3 modules and have the display surface of 8 x 96 light dots. D4L.01A and D4L.03A information boards differ from each other with the structural design of cable entry. Two-row information board D4L.02A comprises 8 modules distributed into 2 rows; it has the display surface of 8 x 128 light dots in each row.

The on-board computer manufactured by Unicontrols a.s Praha controls the above-mentioned types of LED information boards via the CAN bus using the Unican transport protocol.

The electronics consists of the display modules, i.e. printed circuit boards (PCB) with matrix LED displays, PCB with electronic circuits of the control microcomputer with the additional module (it performs the communication of the CAN interface in galvanically isolated version) and the connecting PCB with connecting terminal clips and safety elements. The electronics of the information boards is placed in the steel sheet cabinets with surface finish. Mechanical fixation of LED information boards of D4L.01A and D4L.02A types to the wall of a vehicle is performed with the fixing holes for M5 bolts in the front panel of an information board. The cabinet has a view port of red umaplex in its front part.

CANNON 9 M and CANNON 9 F connectors are designed to connect the CAN bus which interconnects the information boards with the control on-board computer of Unicontrols; three Amphenol connectors for supply conductors and central reset conductors are placed on the rear panel of the information board.

Mechanical fixation of LED information boards of D4L.03A type to the wall of transport means is performed by the fixing holes for M5 bolts in the rear panel of an information board. The cabinet has a view port of red umaplex in its front part.

CANNON 9 M and CANNON 9 F connectors are designed to connect the CAN bus which interconnects the information board with the control on-board panel; 2 penetrations for supply conductors and central reset conductors are at the left side of the information table (front view).

The D4LP.8X editor operated on a PC computer is used to create the database of the displayed signs. The created database is loaded via the RS232 bus to the Unicontrols control on-board computer, which provides its further transfer to the information board via the CAN bus. One can use the RS232 cable to connect PC with the UnoControls control on-board computer.

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Functional characteristics

LED information boards allow to receive and analyse the control characters files (visual representation control, communication control via the CAN bus) as well as the visual presentation of the appropriate alphanumerical text on the display surface of the information table. The list of the control commands with the brief description is given in Enclosure 2.

Loading of the database files (processed into an appropriate format at a PC computer) from the control computer to the information board is performed by the CAN bus. After the files are received they are entered into the FLASH type memory. The data storage in the internal memory is independent from the power supply. These are the database of alphanumerical characters fonts and the database of alphanumerical signs. The maximum volume of the stored data depends of the storage capacity of the FLASH memory and allows the storage of at least 2000 alphanumerical texts of displayable by information boards. The communication upon the database files transfer is carried out in both directions.

After the connection of the supply voltage (resetting) the bright field will run through the display surface (indication of the power supply connection the so-called initial test) and then the empty board will be seen (i.e. no LED is on). The information board is ready for operation.

The central reset is physically implemented with 2 wires with optical separation from the control microcomputer of the information board. The signal induces RESET of the microprocessor and initialisation of the programme from the very beginning, including connection establishment via the CAN bus.

Methods of visual presentation

Information boards allow displaying maximum 2 pieces of information simultaneously. The D4L.01A and D4L.03A one-row boards present the information intended for two rows in turn in the one row, the D4L.02A two-row board displays both pieces of information simultaneously in two rows.

Information boards displays the alphanumerical characters with partial diacritical marks. The standard version of the board contains 5 types of fonts (see Tab. 3), which can be divided into 2 main groups: normal and bold. The maximum number of the used fonts is eight.

ABBREVIATION	DESCRIPTION
SHIFT←	running sign: the text is running from the left to the right
STATIC	static sign: the text is displayed as stationary
ROLL ↑	upward rolling sign: the sign will roll upward
ROLL ↓	downward rolling sign: the sign will roll downward
FLASH	flashing sign
FLASH2	flashing of two signs: two signs are flashing in turns
CHAR ←	sign displayed from the right side character after character: sign is coming from the right side by individual characters
CHAR←	sign falling down character by character: sign is coming from the top by individual characters
CHAR	sign displayed by characters: sign is displayed by characters
SNOW	fading over sign: sign is gradually displayed from the occasionally displayed characters
PAUSE	original sign will stay
START←	displayed sign starts to move away and the new one comes
AUTO	proper operation: the text, which goes into the table is displayed as stationary longer text is displayed as running.

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Information boards display both the signs, which are stored in the database under the four-figure index and the open text. A sign is displayed on the information board till the moment when it is changed (other index or other open text). If there is no sign stored in the database under this index the information board will clear the displayed text and will display an empty board.

Information boards are able to display the required information by various methods. The method of the text presentation is controlled by the initial and end commands which are integral parts of the database files. The initial commands determine the method of text presentation and the end commands determine the method of text erasing. For description of commands see Tables 1 and 2. The method of tests presentation is also regulated by the displaying rate (e.g. upon the "SHIFT←" com-mand the rate of movement of the running test is upon the "ROLL ↑" command the rate of rolling of the text and the display time, which determines for how long the text will be displayed. (Note: Time of display determines the retard only with one-row boards (D4L.01A and D4L.03A) in case there is a requirement to display two rows. Otherwise the text is displayed until it is changed by the appropriate command).

Methods of message presentation and erasing can be combined with each other. The editor restricts the length of the running sign to 256 characters; the length of static signs depends on the length of information board and the type of the used letters (fonts). (E.g. with D4L.02A board it is possible to display 8 x 5 min. 21 characters in normal fonts, 8 x 7 min. 16 characters in bold fonts, with D4L.01A or D4L.03A boards it is possible to display 8 x 5 min. 16 characters with normal fonts, 8 x 7 min. 12 characters with bold fonts). Individual fonts can be arbitrarily combined, not excepting within one sign.

Address of information board

The maximum number of information boards which can be connected to the on-board computer of Unicontrols via the CAN bus is 31. The address is set with the DIL switches at PCB with the electronic circuits of the control microcomputer. It is not allowed to connect two information boards with one and the same address to one bus. The manufacture of the on-board computer performs the concrete setting of the address according to the requirements during installation.

Types of fonts:
The used types of fonts are specified in Table 3. The types of fonts can be changed to order.

Type	Size	Line thickness	Diacritical marks	Description
Font 1	8 x 5	1	Partial	Standard font
Font 2	8 x 7	1, in Y-2 axis	Partial	Bold font
Font 3	8 x 5	1	Partial	Standard font, contracted
Font 4	8 x 7	1, in Y-2 axis	Partial	Bold font, contracted
Font 5	8 x 4	1	Partial	Narrow font
Font 6	8 x 6	1, in Y-2 axis		Figures for hours
Font 7	7 x 6	1, in Y-2 axis		Figures for hours and date

Colour of display dots:

Standard - yellow;
To order - green, orange, yellow

Type identification	Number of rows x columns	Dots Ø (mm)/ number of dots	Cabinet dimension (W x H x D (mm))	Weight (kg)	Demand (A)	Number of fixing holes	Note
EMIS D4L.01	8 x 96	5/768	750 x 120 x 50	5	max. 2	6	one-row type, control signals are supplied at the back
EMIS D4L.02	8 x 128 for 1 row	5/2048	1000 x 210 x 50	8	max. 3	6	two-row type
EMIS D4L.03	8 x 96	5/768	760 x 110 x 50	5	max. 2	4	one-row type, control signals are supplied at the side

LED Information Board

OPERATING CONDITIONS

The equipment is designed for continuous operation in the mass transit means (e.g. buses, trolleybuses, trams, trains etc.) or in the other inside premises in the following environment:

Operating temperature range	(-25 to +40)°C
	T1 Class to ČSN EN 50 155
Non-operating temperature range	(-35 to +70)°C
Relative air humidity	must not exceed 90 %
	Absolute air humidity must not exceed 27 g/m^3
	(within the whole range of operating temperatures steam condensation is not allowed)
Air pressure	(86 to 106) kPa
Working environment:	free of aggressive gases and steam

TECHNICAL PARAMETERS

Dimensions	For dimensions of individual types of equipment, including dimensional sketches of individual types see table above.
Weight	For weights of individual types of equipment see table above.
Supply voltage and current	Supply voltage of electronics is: + 24 VDC -30 % + 25 %, for demands of individual types of equipment see table above.
Number of light dots	For number of light dots of individual types of equipment see table above.

Operation

Operating position:	Arbitrary
Type of operation	Continuous (switching off during operation is allowed)
Life time	10 years of continuous operation

Version, protection degree

The equipment is produced in the so-called standard version to ČSN 30 4002 and must comply with the valid production documents. The parts equivalents, which substitute in the full scope the original type, are allowed.

Protection degree:	IP 52

MECHANICAL PARAMETERS

Vibration resistance:	To ČSN 34 5613. The equipment is resistant against the vibration frequency of 50 Hz with the amplitude of 0.5 mm and the multiple of gravity acceleration of 5 g for 8 hours.
Shock resistance:	To ČSN 34 5613. The equipment is resistant against the shocks of 10 000 impacts with the acceleration of 10 g
Individual blows impacts resistance	To ČSN 34 5791. Equipment is resistant against individual impacts of 15 g.
Electromagnetic compatibility	Emission is to ČSN EN 50 081-2 (Class A), ČSN EN 55011 Resistance is to ČSN EN 50 082-2, IEC 801-3, IEC 801-4

System information

Connecting points:	Apmhenol connectors (D4L.01 and D4L.02) are located at rear panel WAGO terminal clips (D4L.03) are located at the connecting PCB inside the board.
Possibility to connect a bus:	CAN (CANNON 9 pin connectors)
Storage capacity:	128 Kbytes (loading of at least 2000 alphanumerical texts displayable at the information board is possible).