100% electronic voltage detector

_Detecteur de tension 100% électronique_
SUMMARY

1 The customers' technical needs.................4
2 The aimed applications...........................5
3 The technology.....................................5
4 The range...........................................7
5 The main characteristics..........................8
6 The options and accessories.......................10
7 The electrical connections........................10
8 The advantages....................................11
9 The used standards.................................12
10 The technical documentation.....................16

This document cannot be duplicated in any manner, without prior authorization from ABB Entrelec.

SOMMAIRE

1 Les besoins techniques clients...............4
2 Les applications visées...........................5
3 La technologie....................................5
4 La gamme.........................................7
5 Les principales caractéristiques................8
6 Les options et accessoires......................10
7 Les connexions électriques.......................10
8 Les avantages.....................................11
9 Les normes appliquées...........................12
10 La documentation technique.....................16

Ce document ne peut-être dupliqué sous quelque forme que ce soit, sans autorisation préalable de ABB Entrelec.
Technical presentation summary

1 The customer's needs
2 The aimed applications
3 The technology
4 The range
5 The main characteristics
6 The options and accessories
7 The electrical connections
8 The advantages
9 The used standards
10 The technical documentation

1 The customers' needs

- Standards respect
- Reliability & security
- High quality
- High performances
- Compactness
- Price
- Reliable supplier

© ABB Entrelec - 1 - VD Presentation 1.2
Sep 2005
2 The aimed applications

- Traction application
  - Main converters
  - Auxiliary converters
- Other possible applications
  - Windmills
  - UPS
  - Harmonic active filters
- Major function
  - Detection of both dc and ac voltage by LEDs

3 The technology

- Functioning principle

Electronic board to reduce high voltage to low switching current
3 The technology

- The LEDs flashing

- Installation principle

*d.c. or a.c.* voltage

≈ 0.5 sec

≈ 30 msec

≈ 2 Hz

*a.c. voltage under conditions

*PCB = Printed Circuit Board = Circuit Electrique
3 The technology

Technologies comparison for current sensing

<table>
<thead>
<tr>
<th>Standards respected</th>
<th>Neon light</th>
<th>VD technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Trigger level</th>
<th>approx 70V</th>
<th>Adjustable</th>
</tr>
</thead>
<tbody>
<tr>
<td>ac and dc voltage</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Installation</th>
<th>Easy and very compact</th>
<th>Easy and compact</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Power consumption</th>
<th>Very low</th>
<th>Very low</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Visual indication</th>
<th>Good</th>
<th>Flashing and intense</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Cost (product + LCC)</th>
<th>High</th>
<th>Average</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Security</th>
<th>To be done by the customer</th>
<th>Integrated in the product</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Life time (hrs)</th>
<th>approx. 5000</th>
<th>&gt; 100 000</th>
</tr>
</thead>
</table>

4 The range

To detect from 50 up to 1500V d.c. or 1000V a.c.*

- VD1500
  - 1500 = 1500 V d.c. or 1000 V a.c.*

a.c.* under conditions
### 4 The range

- **VD1500: mechanical dimensions**

![Diagram of VD1500 mechanical dimensions](image)

### 5 The main characteristics

- **VD1500: main characteristics**

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Unit</th>
<th>VD1500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal primary voltage (U&lt;sub&gt;N&lt;/sub&gt;)</td>
<td>Vd.c.</td>
<td>1500</td>
</tr>
<tr>
<td>Nominal primary voltage (U&lt;sub&gt;N&lt;/sub&gt;)</td>
<td>Va.c.*</td>
<td>1000</td>
</tr>
<tr>
<td>Max. long duration voltage 5min (U&lt;sub&gt;MAX2&lt;/sub&gt;)</td>
<td>Vmax dc</td>
<td>1950</td>
</tr>
<tr>
<td>Max. peak voltage 20msec (U&lt;sub&gt;MAX3&lt;/sub&gt;)</td>
<td>Vmax dc</td>
<td>2538</td>
</tr>
<tr>
<td>Mass</td>
<td>kg</td>
<td>&lt;0.5</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>°C</td>
<td>-40...+70</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>°C</td>
<td>-40...+85</td>
</tr>
<tr>
<td>LED switching ON/OFF voltage</td>
<td>V d.c.</td>
<td>40...45</td>
</tr>
<tr>
<td>LED color</td>
<td></td>
<td>Red</td>
</tr>
<tr>
<td>LED vision angle</td>
<td>°</td>
<td>&lt;15</td>
</tr>
</tbody>
</table>

- For further requests, please contact us.

  a.c.* under conditions
5 The main characteristics

- LED vision best angle

VD1500

- Low flash intensity
- High flash intensity

5 The main characteristics

- VD1500: trigger characteristics (d.c. voltage)
  - $U_P > 45V$ : 2 LEDs flashing
  - $U_P < 40V$ : 2 LEDs OFF
  - $40V < U_P < 45V$ : 2 LEDs flashing or OFF

<table>
<thead>
<tr>
<th>Volts d.c.</th>
<th>LEDs OFF</th>
<th>LEDs flashing or OFF</th>
<th>LEDs ON</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>41</td>
<td>44</td>
<td></td>
</tr>
<tr>
<td>41</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>44</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6 The options and accessories

- Options
  - Primary voltage terminals
  - LEDs switching on/off threshold
  - Remote visualisation of LEDs

- Accessories
  - Maintenance kit for LEDs replacement

7 The electrical connections (d.c. voltage)

- Security: full redundancy

Diagrams show:
- Capacitors bank
- 2 different terminals
- 2 different cables
- HT1-, HT1+, HT2+, HT2-
- LED 1 and LED 2
- PCB and PCB* connections
- Voltage Detector

Regular maintenance is a key issue.
7 The electrical connections (d.c. voltage)

- Security: different terminals

![Diagram of electrical connections with terminals labeled HT1+, HT2+, HT1-, HT2- and voltage detector blocks with LED 1 and LED 2.]

8 The advantages

- Construction
  - The first traction voltage detector fully compliant with standards
  - High reliability detector (double function with reparable parts)
  - A voltage detector 100% resin potted
    - Electronic board protected
    - Withstand high vibration constraints
    - High thermal capacities
  - The best compromise: performance/volume/price
  - No need of external power supply
  - Recyclable packaging
9 The used standards: railways applications

- **CF60-100**: SNCF specifications
  - To specify the rules to apply for the design of parts and assemblies in order to protect personal against electrical shocks
  - §6 Particular measures for capacitors
    "The permanent discharge circuit must be designed to drop down the residual voltage from the max. nominal voltage to less than 50V in less than 1 minute for nominal voltage below 500V and in less than 5 min for nominal voltage above 500V. In such case, a visual system must be implemented externally to the cabinet or coffer to indicate the presence of a voltage greater than 50V. This system consists of 2 lights connected directly to any single or capacitors bank. The lights remain switched on, while residual voltage is above 50V.

- **EN50155 (Dec 2002)**
  - Testing (see details in the concerned Type Test Report)
    - Functioning: @ +25°C, @-40°C, @+70°C
    - : overload
    - : magnetic environment
  - Other climatic tests: salt mist
    - : humid heat cycling
    - : storage
9 The used standards: railways applications

- **EN50163 (Nov 1995)**
  - Standard rated voltages
    | Rated voltage ($U_N$) | 1500Vdc |
    | Umax1 (permanent)    | 1800Vdc |
    | Umax2 (max. 5 min)   | 1950Vdc |
    | Umax3 (20msec)       | 2538Vdc |

9 The used standards: railways applications

- **EN50121-3-2 (Sep 2000)** for ground mobile equipments
  - Electro-magnetic compatibility (see details in the concerned Type Test Report)
    - Immunity:
      - burst
      - surges
      - electrostatic discharges
      - conducted perturbations
      - electromagnetic fields
      - network magnetic fields
    - Emission:
      - conducted
      - radiated
9 The used standards: railways applications

- **IEC61373 (Jan 1999)** for ground mobile equipments
  - Vibrations and shocks (see details in the concerned Type Test Report)
    - Tests: random vibrations with functional sensor
      - random vibrations without functional sensor
    - shocks
  - Vibrations severity: category I class B

- **EN50124-1 (Jan 1999)**
  - Insulation coordination
    - Rated voltage: 1500Vdc (1950Vdc for 5min)
    - Pollution degree: PD2 (no conductivity and low humidity with rare condensation)
    - Insulation distance: OV3 (same as OV4 with less requirements on over voltages, reliability & disponibility)
      - 23.6 mm air distance (reinforced insulation)
      - material group II (400<CTI<600)
    - Creepage distance: 27.7mm (reinforced insulation) with grooves having minimum 1.5 mm

9 The used standards: railways applications

- EN50129 (May 2003): Security Electronic Device
  - Design documentation for approval:
    - Management quality folder
    - Management security folder
    - Technical and functional security folder
    - Security approval
  - Design levels
    - SIL 2 ($1 \times 10^6 < \text{MTBF "hours"} < 1 \times 10^7$)
    - Full redundancy
    - Preventive and curative maintenance

- Other specs:
  - NFF16101 & NFF16102
    - Usage: category A1
    - Class : 2 (technical location)
    - Class : 3 (passenger or driver location)
  - FS306158 (Dec 1995)
  - CF60-100 (Feb 1984)
9 The used standards: industrial applications

- IEC60038 (Feb 2002):
  - Standard industrial voltage
    - Rated voltage: 1000V a.c. under conditions

10 The technical documentation

- Technical file
  - Technical presentation: this document
  - Mounting instructions
  - Usage and maintenance
  - Data sheets
  - Type tests report
  - MTBF calculation
  - Fire/smoke certificate
  - Environmental certificate
As part of its on-going product improvement, ABB reverses the right to modify the characteristics of the products described in this document. The information given is not contractual. For further details please contact the Company marketing these products in your country.