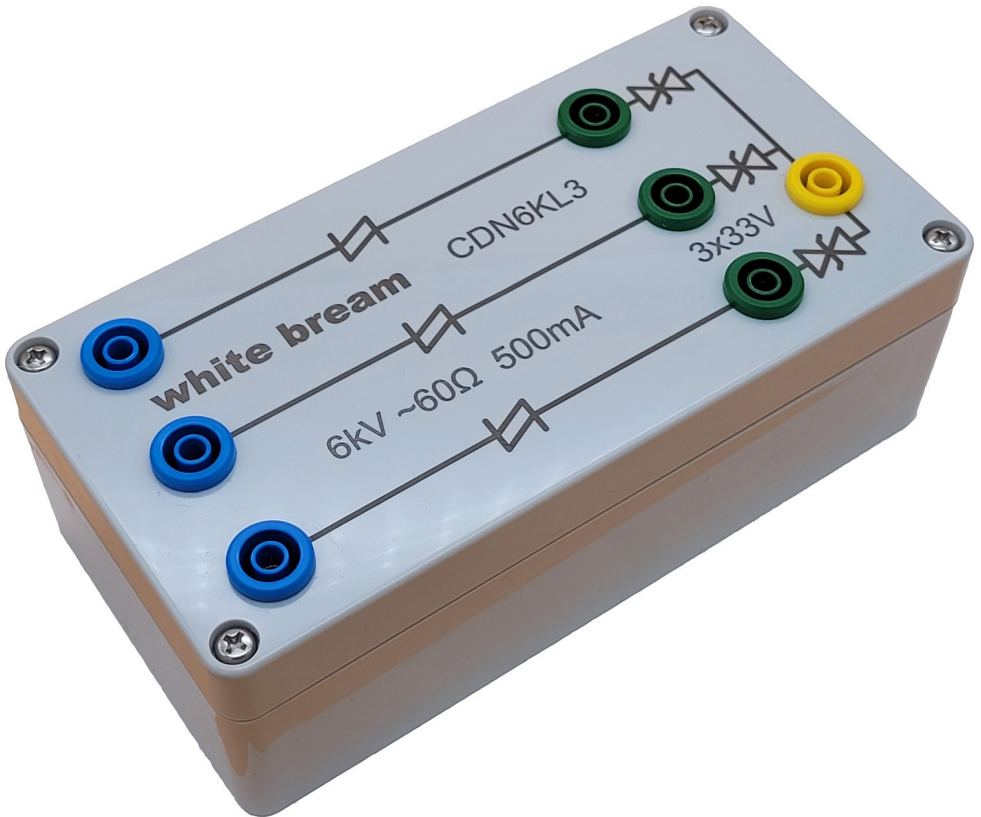


**white bream**

# Surge Decoupling Networks



<b>White Bream Oud-Beijerland The Netherlands</b> <a href="https://whitebream.com">https://whitebream.com</a>		
Description:	Reference manual	T443RP002 Manual CDN6KLx.odt
Project:	T443	 * T 4 4 3 R P 0 0 2 *
Status:	Draft	

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# I Preface

## I.1 Disclaimer

White Bream products are not authorized for use in or in connection with surgical implants, or as critical components in any medical, nuclear, or aircraft or other transportation devices or systems where failure to perform can reasonably be expected to cause significant injury to the user, without the express written approval of an executive officer of White Bream. Such use is at buyer's sole risk, and buyer is responsible for verification and validation of the suitability of products incorporated in any such devices or systems. Buyer agrees that White Bream is not liable, in whole or in part, for any claim or damage arising from such use and shall have no obligation to warranty such products. Buyer agrees to indemnify, defend and hold White Bream harmless from and against any and all claims, damages, losses, costs, expenses and liabilities arising out of or in connection with buyer's use of White Bream products in such applications to the extent buyer has not obtained the express written approval of an executive officer of White Bream.

## I.2 Trademarks & copyrights

Throughout this manual, the trade names and trademarks of various companies and products may have been used, and no such uses are intended to convey endorsement of or other affiliations with this manual or product. Any brand names or product names used within this manual are trademarks or registered trademarks of their respective holders.

## I.3 Warranty

This product is warranted to be in good working order for a period of two years from the date of purchase. Should this product fail to be in good working order at any time during this period, we will, at our option, replace or repair it at no additional charge except as set forth in the following terms. This warranty does not apply to products damaged by misuse, modifications, accident or disaster.

## I.4 Liability

White Bream assumes no liability for any damages, lost profits, lost savings or any other incidental or consequential damage resulting from the use of, misuse of, or inability to use this product. White Bream will not be liable for any claim made by any other related party.

## 1.5 Technical support

White Bream technicians and engineers are committed to providing the best possible technical support for our customers so that our products can be easily used and implemented. We request that you first visit our website at [whitebream.com](http://whitebream.com) for the latest documentation, utilities and drivers, which have been made available to assist you. If you still require assistance after visiting our website then contact our technical support department by email at [support@whitebream.com](mailto:support@whitebream.com).



### Warning

Warning messages in the manual may contain important information against product malfunction or safety information for the (end-)user.



### Caution

Notices regarding proper use of the product and to warn the user about how to prevent damage to hardware or loss of data.



### ROHS - WEEE

White Bream products are manufactured using lead-free components and assembly processes. Please dispose of products according local waste regulations.

## 2 Description

EMC testing calls for surge immunity testing per IEC/EN 61000-4-5 among others. This is performed on all longer connections ( $> 10\text{m}$ ) of a operational system. In order to prevent transient energy from going the wrong way, a decoupling network is used. Usually, these consist of large air-core or iron-cored inductors and a bunch of voltage clamping devices such as varistors.

For mains coupling, this is perfectly fine. The frequency is very low, so the voltage and current won't be affected by those inductors very much. Things get different at lower voltages and higher frequencies. Single inductors will affect the data signal just as much as the transients, if not more. A sort of recommended solution exists in the form of common mode inductors. These will allow for balanced communication signals such as RS485, CAN-bus and Ethernet. However, these common mode inductors won't do anything against differential mode signals. And due to the construction of balanced surge coupling networks, there is no guarantee that there won't be any differential surge energy. And even if the construction were perfectly balanced, things would get screwed anyway if one of the signals got shorted inside the EUT. Either of these issues will cause a large amount of energy to be diverted into the associated equipment!

The first solution is to provide surge suppression. However, that has the downside of dissipating surge energy that should have been directed at the EUT. Another approach is to decouple from the transient in a bit more literal way. That is the method that we choose for these decoupling networks.

### 2.1 Design

We wanted a decoupling network to facilitate engineering and production testing of our rugged CAN.net devices. This requires power and one or more CAN busses to create an operational CAN network which must be able to deal with simultaneous application of  $1.2/50\mu\text{s}$  and  $10/700\mu\text{s}$  surges.

The decoupling network consists of a string of Bourns TBU devices which disconnect their terminals when the current exceeds  $500\text{mA}$ . While disconnected, only a small holding current is present. This is way less than the typical surge energy, therefore has negligible effect on the transient pulse, particularly after being triggered.

### 2.2 Cautions



The Surge Decoupling Networks are intended for use by trained personnel only!

## 3 Specifications

### 3.1 Electronic

Parameter	Min	Typ	Max	Unit
Maximum current	500			mA
Protection trip current			1000	mA
Series resistance		60		$\Omega$
Parallel resistance		180		k $\Omega$
Trip delay			1	$\mu$ s
Protection reset voltage	12	16	20	V
Surge line-neutral, 10/700 $\mu$ s		6		kV

### 3.2 Environmental

Parameter	Min	Max	Unit
Operating temperature range	10	+40	$^{\circ}$ C
Non-operating temperature range	-40	+85	$^{\circ}$ C
Humidity	10	90	%RH
Altitude		2	km
Ingress Protection	IP52		

## 4 Maintenance & support

In principle, the device has no serviceable parts inside.

### 4.1 Verification

Measure series resistance  $60\Omega \pm 10\%$  for each line.

Apply 60V between each line and ground, and verify current after inrush is  $\leq 1\text{mA}$ .

Apply 60V between each line and ground, and verify output voltage is clamped  $\leq 40\text{V}$ .

#### 4.1.1 Enhanced verification

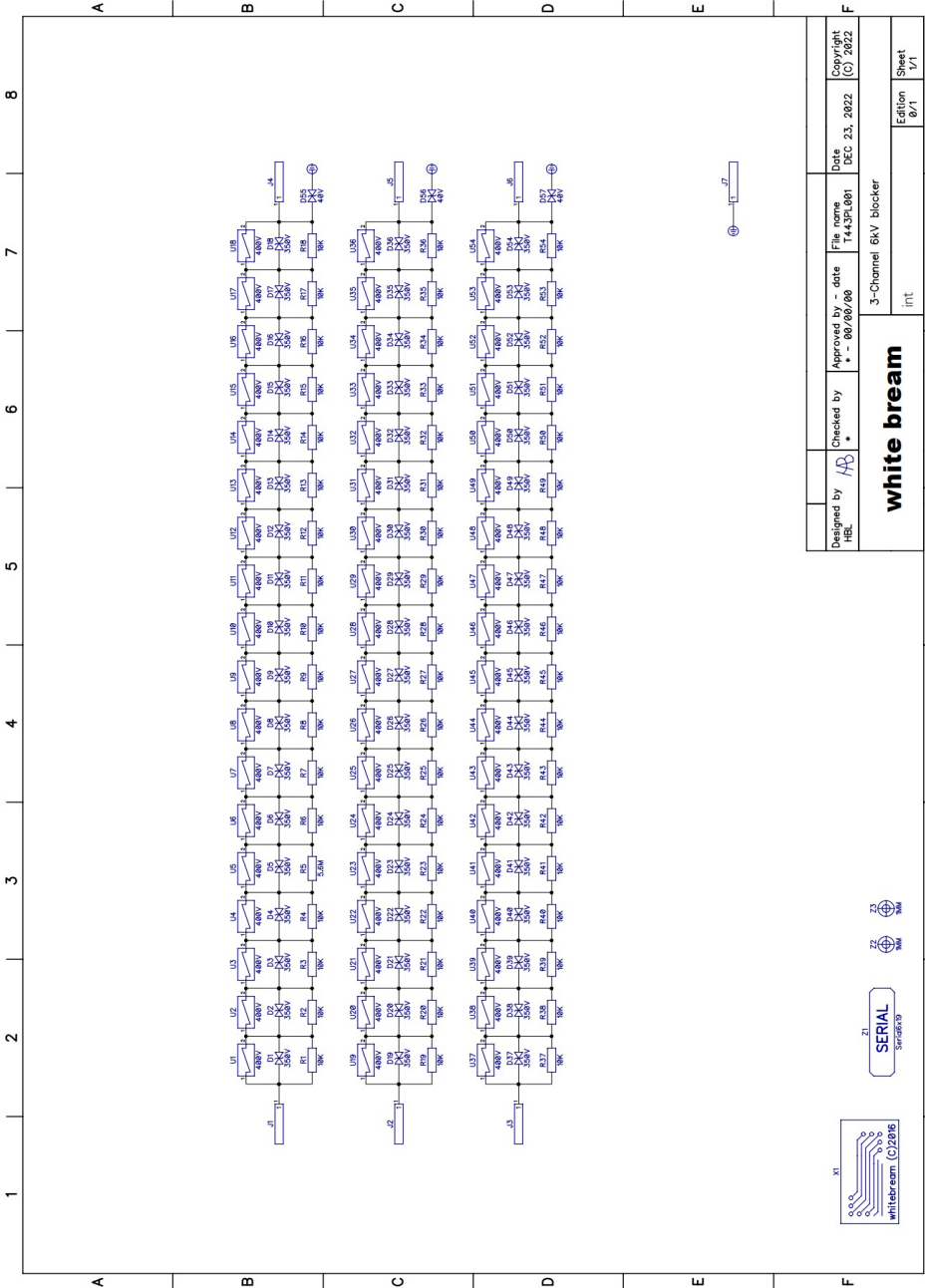
Bias output voltage to 33V and apply  $\pm 6\text{kV}$  10/700 $\mu\text{s}$  surge between each line and ground, record input and output voltages.

### 4.2 Calibration

Calibration is not required.

### 4.3 Schematic

Next page shows the schematic of the 3-channel version of the Surge Decoupling Networks.



Designed by HBL	Checked by AB	Approved by - date * - 00/00/00	File name T443PL001	Date DEC 23, 2022	Copyright (C) 2022
<b>white bream</b>			3-Channel 6kV blocker		
			int		



## 5 Ordering information

Partno	Description	Revision
84-443-010	Surge decoupling network CDN6KL3	0/1, Jan 2, 2023
84-443-030	Surge decoupling network CDN6KL6	0, Jan 24, 2023

### 5.1 Hardware revision info

Rev	Date	Changes
0/1	Jan 2, 2023	Change of series resistor value and type

## 6 Document revisions

### 6.1 Rev 0.1 (May 11, 2023)

Ref	Description
-	Initial version

## Annex A: Declaration of Conformity for CE

The manufacturer hereby declares that this product is in accordance with the requirements of directive 2014/30/EU regarding electromagnetic compatibility (EMC), directive 2014/35/EU regarding low voltage equipment (LVD), directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS) and directive 2012/19/EU on waste electrical and electronic equipment (WEEE).

**Manufacturer, facility:** White Bream  
L.J. Costerstraat 13d  
3261 LH, Oud-Beijerland  
The Netherlands

**Product:** Surge Decoupling Networks

**Models:** CDN6KLx (84-443-0x0)

**CE & RoHS Marking:**  

May 2, 2023  
Henk Blijk, White Bream, Owner



This product has been found in conformity with directive 2014/30/EU (EMC) by testing and verification with the following standards <sup>1</sup>:

- **EN 61000-6-2:2016** Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity standard for industrial environments
- **EN 61000-6-3:2020** Electromagnetic compatibility (EMC) – Part 6-3: Generic standards – Emission standard for equipment in residential environments
- **EN 61326-1:2020** Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements

This product has been found in conformity with directive 2014/35/EU (LVD) by testing and verification with the following standards:

- **EN 61010-1:2010/CI:2011** Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements

This product has been found in conformity with directive 2011/65/EU (RoHS) by testing and verification with the following standards:

- **EN 63000:2018** Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

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<sup>1</sup> Some standards might be more recent than the harmonized versions. Blame Brussels.


## Annex B: Declaration of Conformity for UKCA

The manufacturer hereby declares that this product is in accordance with the requirements of UK SI 2016 No. 1091 "Electromagnetic Compatibility Regulations 2016", UK SI 2017 No. 1206 "Radio Equipment Regulations 2017", UK SI 2016 No. 1101 "Electrical Equipment (Safety) Regulations 2016", and UK SI 2012 No. 3032 "The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012".

**Manufacturer, facility:** White Bream  
L.J. Costerstraat 13d  
3261 LH, Oud-Beijerland  
The Netherlands

**Product:** Surge Decoupling Networks

**Models:** CDN6KLx (84-443-0x0)

**UKCA Marking:** The UKCA marking consists of the letters 'UK' stacked above 'CA' in a bold, sans-serif font. To the right of this text is a crossed-out wheeled bin symbol, which is a standard icon for 'no incineration'.

May 2, 2023  
Henk Bliet, White Bream, Owner

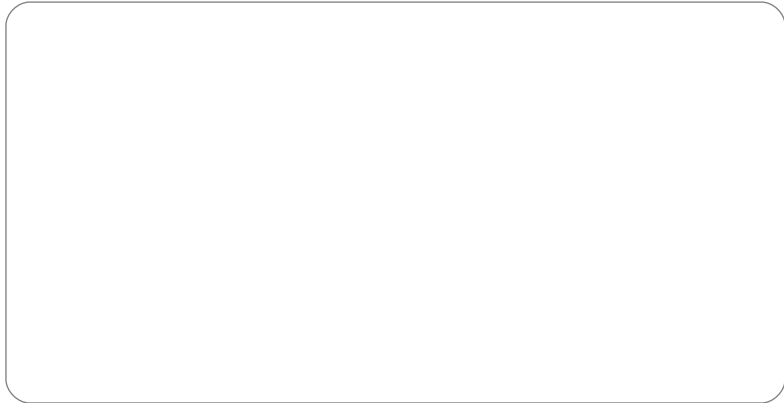


## **Annex C: Declaration of Conformity for FCC**

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

**NOTE:** This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help



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