

# Manual

## For Operation



### CN 200N Series,

- CN 200N100,
- CN 200N200,
- CN 200N300

Audio transformer assembly for LF conducted immunity testing for electrical vehicles

The CN 200N Series is a standalone coupling network unifying up to three audio transformers, each with 100 A capacity, for various test requirements (e.g. LV 123, ISO/TS 7637-4 draft). The CN 200N Series is used to apply the test signals to the lines under test via an audio transformer to perform ripple voltage tests and continuous or transient conducted immunity tests.

- ISO 7637-4
- LV 123
- VW 80300
- VW 80303



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## 1. Standards covered by CN 200N Series

The CN 200N Series are especially designed for testing the following standards:

### Automotive

ISO 7637-4 (Draft)

LV 123

VW 80300

VW 80303

### 1.1. General

The CN 200N series are standalone couplers with one, two or three transformers in parallel, designed for E-vehicle applications where ripple must be superimposed on HV lines.

As the secondary carries all of the current, we have defined three models, the CN 200N is available in three different models depending on the current needed by the DUT.

#### Models

CN 200N100	100A secondary
CN 200N200	200A secondary
CN 200N300	300A secondary

## 2. Operating Functions

### 2.1. Front view



Figure 2.1

1. Transformer Input (Primary)
2. Transformer Output (Secondary)



### 2.2. Rear view



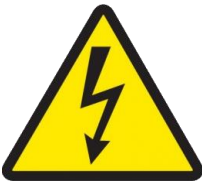
Figure 2.2

- 1 Reference Earth connection
- 2 Cooling grids ( passive cooling)

### 2.3. Warnings on the Test System

	<p><b>Danger!</b></p> <p>The test sysetem is up to 57kg and a two-person lift must be used!</p>
	<p><b>Caution!</b></p> <p>Warning of a danger spot (refer to the documentation)</p>

## 2.4. General Safety

	<p><b>DANGER!</b></p> <p><b>Risk of electric shock!</b></p> <p>While the CN 200 series generates no dangerous voltages on its own, output connections must not be handled while disturbances are being generated, or the power supply is connected. In normal usage, high voltages and currents are present at the output terminals.</p>
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	<p><b>WARNING!</b></p> <p><b>Operation without a ground connection is forbidden!</b></p>
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The test system may only be operated by a qualified specialist, within specific usage provided by the manufacturer. Since the device is principally a passive component, it must be disconnected from any sources before any modifications to the test setup are undertaken. Besides the power connections themselves, certain components also operate at high voltages, and are not provided with any form of extra protection against accidental contact.

In the test setup, users must ensure that the isolation of the cables used meets or exceeds 1200V the supply voltage and up to 300A DUT current.

The ventilation supplied with the device may not be covered or impeded in a way that could affect cooling performance.

To place the device in a fully safe condition, ensure that any voltage to the generator has been switched off and the cables removed fully.

The generator must be operated only by authorized and trained specialists only.

The safety is not guaranteed when using the device in other applications not specified in this guide.

Under normal operating conditions no toxic gases are released.

### 3. Test Equipment CN 200N Series

#### 3.1. Block diagram

The CN 200N series are easy-to-use coupling device consisting of audio transformers designed for voltage ripple testing on HV battery lines.

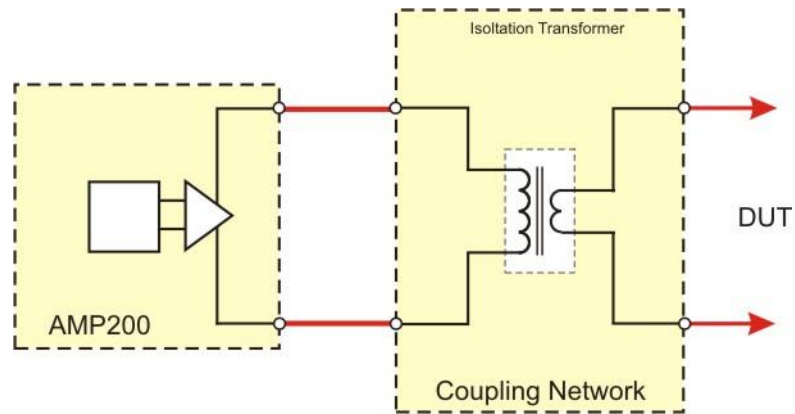


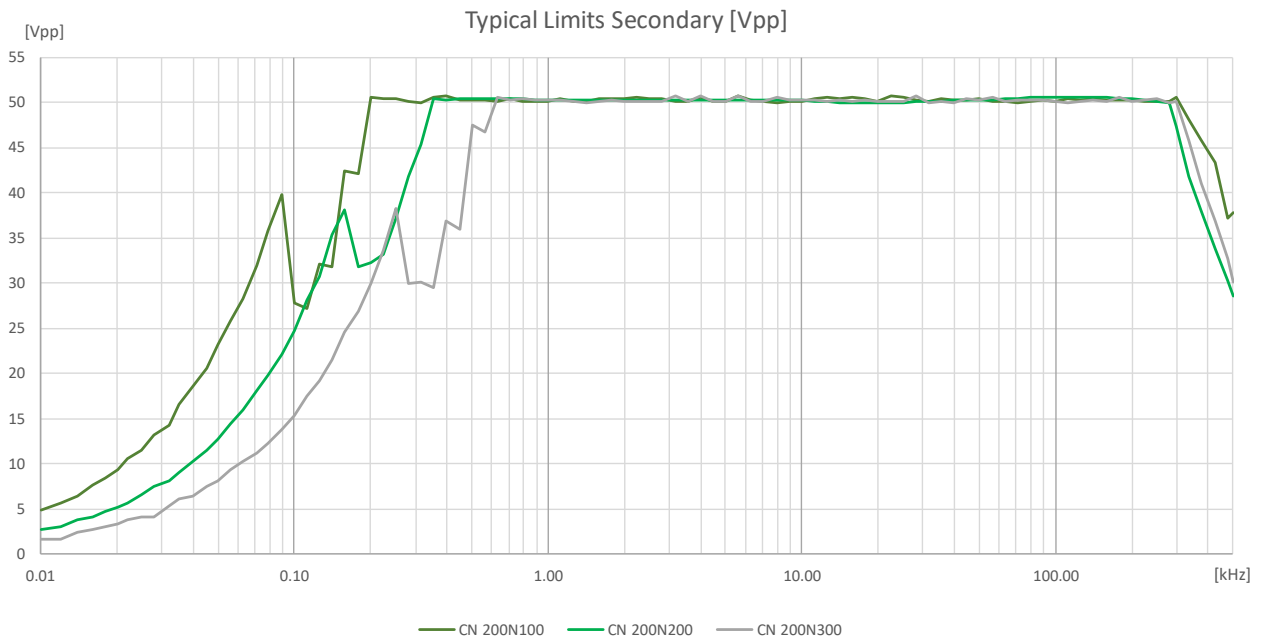
Figure 3.1: Typical Usage with AMP 200



## 4. Technical data

### 4.1. Audio isolating transformer characteristics

Frequency range	10Hz – 500kHz
Audio power	200W per transformer
Primary Resistance	< 5 ohms (frequency dependant)
Secondary Resistance	¼ of the primary impedance
Secondary saturation	CN 200N100: 100A CN 200N200: 200A CN 200N300: 300A
Turns ratio	2:1 step down
Dielectrical isolation	1200 V dc primary to secondaries and each winding to end bells
Secondary inductance	Approx. 1.0 mH (unloaded)
Typical Output Capability	See below when using the AMP 200N1.1



## 4.2. Connectors

Primary connectors	High current safety receptable 6mm with integrated 4mm stepdown connector
Secondary connectors	CN 200N100: High current safety receptable 6mm CN 200N200: Multi-Contact ID/S16BV-NS socket (C1 Coded) CN 200N300: Multi-Contact ID/S16BV-NS socket (C1 Coded)

## 4.3. General

Dimensions	CN 200N100: 447 mm x 582 mm x 154 mm CN 200N200: 447 mm x 582 mm x 154 mm CN 200N300: 447 mm x 582 mm x 288 mm
Weight	CN 200N100: 20 kg CN 200N200: 38 kg CN 200N300: 57.4 kg
Supply voltage	N/A (passive)
Cooling	passive cooling
Temperature	10°C - 40°C
Humidity	20 to 85% relative humidity (RH) non-condensing

## 5. Maintenance

### 5.1. General

The CN 200N series are maintenance-free.

### 5.2. Cleaning

In general, a moist cloth is sufficient for cleaning the outer housing. If necessary add a small amount of a mild, non-foaming household cleanser.

No chemicals (acid, etc.) should be used for cleaning purposes.

Before beginning to clean the test system ensure that it is switched off and the mains power cable is unplugged from the supply.

### 5.3. Calibration and Verification

#### 5.3.1. Factory calibration

Every EM TEST generator is entirely checked and calibrated as per international standard regulations before delivery. A calibration certificate is issued and delivered along with a list of the equipment used for the calibration proving the traceability of the measuring equipment. All auxiliary equipment and accessories are checked to our internal manufacturer guidelines.

The calibration certificate and the certificate of compliance (if available) show the date of calibration.

The EM Test equipment are calibrated in the factory and marked with a calibration mark. The used measuring instruments are traceable to the Swiss Federal Office of Metrology.

The calibration date is marked. The validity of the calibration is to the responsibility of the user's quality system. Neither the certificate of calibration nor the corresponding label mark any due date for re-calibration.



Example: Calibration mark

#### 5.3.2. Guideline to determine the calibration period of EM Test instrumentation

Our International Service Departments and our QA Manager are frequently asked about the calibration interval of EM TEST equipment.

EM TEST doesn't know each customer's Quality Assurance Policy nor do we know how often the equipment is used and what kind of tests is performed during the life cycle of test equipment. Only the customer knows all the details and therefore the customer needs to specify the calibration interval for his test equipment.

In reply to all these questions we like to approach this issue as follows:

EM TEST make use of a solid state semiconductor switch technique to generate high voltage transients. A precious advantage of this technique is the absolute lack of periodical maintenance effort. In consequence thereof a useful calibration period has to be defined based on two criteria:

- The first one is the customer's Quality Assurance Policy. Any existent internal regulation has to be applied at highest priority. In the absence of such internal regulation the utilization rate of the test equipment has to be taken into consideration.

- Based on the experience and observation collected over the years **EM TEST recommends a calibration interval of 1 year** for frequently used equipment. A 2-years calibration interval is considered sufficient for rarely used test generators in order to assure proper performance and compliance to the standard specifications.

##### 5.3.2.1. Calibration of Accessories made by passive components only

Passive components do not change their technical specification during storage. Consequently the measured values and the plots stay valid throughout the storage time. The date of shipment shall be considered as the date of calibration.

##### 5.3.2.2. Periodically In-house verification

Please refer to the corresponding standard before carrying out a calibration or verification. The standard describes the procedure, the tolerances and the necessary auxiliary means. Suitable calibration adapters are needed. To compare the verification results, EM Test suggests referring to the wave shape and values of the original calibration certificate.

All calibrations and verifications are always done without mains supply voltage connected to the coupling network input.



## 6. Delivery Groups

### 6.1. Basic equipment

The delivered packing list is in each case valid for the delivery.

- Coupling Network type CN 200N100...N300
- CN 200N300:
  - 2 x KBT16BV-AX/M50L/240-C1 Mating connectors
  - 1 x 2M Safety Cable Red
  - 1 x 2M Safety Cable Black
- CN 200N200:
  - 2 x KBT10BV-AX/M25/50-70-C1 Mating connectors
  - 1 x 2 M Safety Cable Red
  - 1 x 2 M Safety Cable Black
- CN 200N100:
  - 1 x 2 M Safety Cable Red
  - 1 x 2 M Safety Cable Black

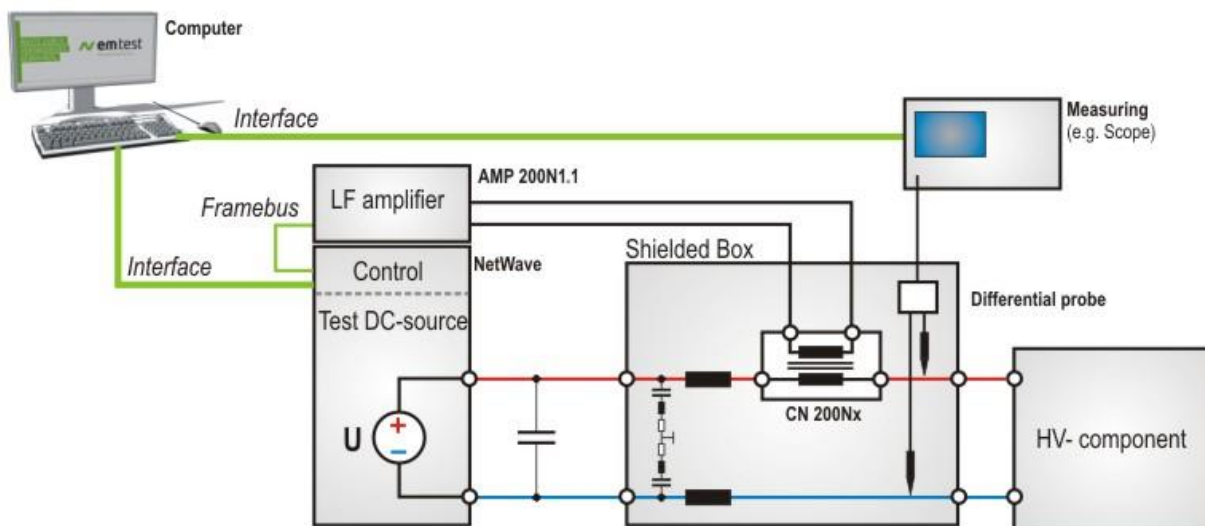


## 7. Application

### 7.1. Usage

The typical usage is to couple sine waves onto HV lines for testing components that are to be used in E-vehicles.

In this example, net.control is used to control a NetWave set to DC, and using the Immunity Play function in netwave, control the LF amplifier to generate the sine waves, which will be coupled over the CN 200N100, CN 200N200 or CN 200N300 transformer onto HV lines. For tests like ISO/TR 7637-4 (draft) an artificial network, available from Teseq, specifically designed for this, can be used.



See section 4 Technical Specifications to see typical limitations at the output of the transformer, so at very low frequencies it may be necessary to generate this test directly from the Source.

The above figure was taken directly from the standard. Users are responsible for safety in the test setup by using a correctly installed circuit breaker on HV battery lines. Up to 300A and 1200V depending on the model.

## 8. Appendix

### 8.1. Declaration of CE-Conformity

Manufacturer : **AMETEK CTS GmbH**  
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Declares, that under its sole responsibility, the product's listed below, including all their options, are conformity with the applicable CE directives listed below using the relevant section of the following EC standards and other normative documents.

Product's name: Low frequency coupling network for supply simulation  
 Model Number(s) CN 200N100, CN 200N200, CN 200N300

#### Low Voltage Directive 2014/35/EU

Standard to which conformity is declared:

EN 61010-1 : 2011 Safety requirements for electrical equipment for measurement, control, and laboratory use.

#### EMC Directive 2014/30/EU

Standard(s) to which conformity is declared:

EN 61326-1 : 2012 Electrical equipment for measurement, control and laboratory use Class A  
 EN 61000-3-2 : 2014 Limits for harmonic current emissions  
 EN 61000-3-3 : 2013 Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems.

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