Manual

For Operation

AMP 200N
AMP 200N1.1
AMP 200N2

Low frequency signal source for supply simulation and magnetic fields

The AMP 200N series has been designed as a low-frequency signal source to generate sinusoidal signals used to simulate ripple noise and ground shift noise as required by a variety of standards in the automotive, aircraft and military industry.
The AMP 200N devices is controlled by the EM TEST Autowave to also allow the generation of non-sinusoidal and customized signals. Additionally, the AMP 200N series can be used to generate magnetic fields by means of a radiation loop or small Helmholtz coils.

- Ford FMC 1278
- Ford EMC-CS-2009
- ISO 11452-8
- ISO 7637-4 (Draft)
- LV 123
- SAE J1113-2
- Daimler Chrysler DC xx
- Fiat 9.90110
- GMW3097
- PSA/Renault EQ/IR 02
- VW TL 82566
- Mercedes MBN 10284-2
- Nissan 28401 NDS 02
- GLoyd GL VI-7-2

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Specifications subject to change

Contents

1 Safety

1.1 Safety Aspects

Observe all precautions to assure your personal safety. The generators comply with Installation Category II (excess voltage section).

Pay special attention to safety and operation details!

1.2 Safety and warning label on the device

Please take note of the following explanations of the symbols used in order to achieve the optimum benefit from this manual and to ensure safety during operation of the equipment.

		This symbol warns of a potential risk of shock hazard. The symbol on an instrument shows that that it can source 1000 volt or more, including the combined effect of normal and common mode voltages. Use standard safety precautions to avoid personal contact with these voltages.
		This symbol indicates where a caution is required. Refer to the operating instructions located in the manual in order to protect against personal injury or damage the equipment.
		**GROUND** Indicates protective Ground Terminal
	***CAUTION"**	The "CAUTION" symbol indicates a potential hazard. It calls attention to a procedure, practice or condition which, if not followed, could possibly cause damage to equipment. Such damage may invalidate the warranty. If a "CAUTION" is indicated, do not proceed until its conditions are fully understood and met.
	"WARNING"	The "WARNING" symbol indicates a potential hazard. It calls attention to a procedure, practice or condition which, if not followed, could possibly cause bodily injured or death. If a "WARNING" is indicated, do not proceed until its conditions are fully understood and met.

Power Supply
If not stated otherwise, the equipment is intended to operate with a power supply not to exceed 250 volts between phase and neutral or between phase and ground. A proper ground connection through the ground connector of the power cord is essential for safe operation.

Grounding the Generators
The generators are grounded through the power cord. To avoid electric shock, plug the power cord into a properly installed receptacle which was tested by a qualified electrician. Have the test performed before connecting equipment.

Without the protective ground connection, all parts of the generators are potential electric shock hazards. This may include components which appear to be insulated. The equipment **MUST NOT BE USED** if this protection is altered.

Use the Proper Power Cord
Use only power cords and connector specified for your product. Use only power cords in good condition.

Use Proper Fuses
To avoid fire hazard, use only fuses as specified in the parts listing for your product - matching type, voltage and current rating.

Do Not Remove Covers or Panels

To avoid personal injury, do not operate the generators without panels and covers.

Do Not Operate in an Explosive Environment

Electric Overload
Never apply power to a connector which is not specified for that particular voltage/current.

1.3 Responsibility of the operator

These operating instructions form an essential part of the equipment and must be available to the operator at all times. The user must obey all safety instructions and warnings.

WARNING

The purpose of this instrument is the generation of defined interferences signals for EMI immunity testing. Depending on the arrangement of the test rig, the configuration, the cabling and the properties of the EUT itself, a significant amount of electromagnetic radiation may result that could also affect other equipment and systems.

The equipment is designed to operate in industrial environment. For operating in other or sensitive environment, such as light industry, airport area…, the user may use a shielded room for operate.

The user himself or herself is ultimately responsible for the correct and controlled operation of the rig. In case of doubt, the tests should be carried out in a Faraday cage.

1.4 General hazard

Before applying power to the system, verify that your product is configured properly for your application.

WARNING

The generators and their accessories operate at high voltages.

Hazardous voltages may be present when covers are removed. Qualified personnel must use extreme caution when servicing this equipment.

Circuit boards, test points, and output voltages also may be floating above (below) chassis ground.

The design of external insulation must be such that it exceeds the maximum voltages of the device.

WARNING

Risk of electrical shock by touching the output plugs

Only *qualified personnel* who deal with attendant hazards in impulse generators, are allowed to perform installation and servicing.

Ensure that the AC power line ground is connected properly to the Power Rack input connector or chassis. Similarly, other power ground lines including those to application and maintenance equipment *must* be grounded properly for both personnel and equipment safety.

Always ensure that facility AC input power is de-energized prior to connecting or disconnecting any cable.

The user must ensure that the output power lines are labeled properly as to the safety hazards and that any inadvertent contact with hazardous voltages is eliminated.
Guard against risks of electrical shock during open cover checks by not touching any portion of the electrical circuits. Even when power is off, capacitors may retain an electrical charge. Use safety glasses during open cover checks to avoid personal injury by any sudden component failure.

Neither AMETEK CTS GmbH, nor any of the subsidiary sales organizations can accept any responsibility for personnel, material or inconsequential injury, loss or damage that results from improper use of the equipment and accessories.

WARNING **Personnel fitted with a heart pacemaker must neither operate the instrument nor approach the test setup while a test is being executed.**

Only approved accessories, connectors, adapters, etc. are to be used to ensure safe operation.

1.5 Qualification of personnel

The generator must be operated only by authorized and trained specialists with detailed knowledge of the international, national or manufacturer's test standard.

2 Standards covered by AMP 200N Series

The AMP 200 is special designed for testing the following standards.

ISO 11452-8
SAE J1113-2
Daimler Chrysler DC 10614-15
Fiat 9.90110 Rev.13 (2007-03)
GMW3097
PSA/Renault EQ/IR 02
VW TL 82566
Mercedes MBN 10284-2
Nissan 28401 NDS 02 Rev.4
GLoyd GL VI-7-2

Automotive	
ISO 11452-8	external/internal Magnetic Fields
SAE J1113-2	Voltage Ripple Test, Closed loop / Substitution
Daimler Chrysler DC10614	Magnetic field Rev B
Daimler Chrysler DC11224	Magnetic field
Daimler Chrysler DC10615 Rev D	Supply voltage ripple
Fiat 7_Z0450_2004	Magnetic field
Fiat 9.90110 Rev.13 (2007-03)	Magnetic field
Ford EMC CS 2009 RI140	Coupled Immunity
Ford EMC CS 2009 RI150	Coupled Immunity
Ford EMC CS 2009 CI250	Immunity to Ground Voltage Offset
GMW3097	Magnetic fields
PSA EQ/IR 02	Magnetic fields
Renault EQ/IR 02	Magnetic fields
VW TL 82566	Magnetic fields
MAN M3285	Magnetic fields
Mercedes MBN 10284-2	Magnetic fields
Nissan 28401 NDS 02 Rev.4	Magnetic fields
Volvo STD	Magnetic fields

Other

GLoyd GL VI-7-2	Voltage Ripple test

2.1 General

The AMP 200N series have been designed as a low-frequency signal source to generate sinusoidal signals used to simulate ripple noise and ground shift noise as required by a variety of standards in the automotive industry e.g. as per Ford, CI 210 and CI 250 as well as RI 150. The AMP 200N is controlled by the EM TEST Autowave to also allow the generation of non-sinusoidal and customized signals. Additionally, the AMP 200N can be used to generate magnetic fields by means of a radiation loop or small Helmholtz coils as per RI 140 of Ford EMC-CS-2009.1 and Ford FMC 1278.

3 Delivery Groups and Put in service

Identical accessory parts are delivered only once if several devices are ordered. The delivered packing list is in each case valid for the delivery.

3.1 Basic equipment AMP 200N Series

- Pulse generator type — AMP 200N, AMP 200N1.1 and AMP 200N2
- Power Mains cable — Country specific plug
- Control cable (Framebus) — SubD 15 pin male / female for AMP200N to (AutoWave or NetWave)
- Signal cable — 2 meter BNC cable
- AMP 200N Manual — HW manual on USB memory stick, English
- Software — Control and Documentation (AutoWave.control or Netwave.control)
- AW License
- Manual — Software manual USB memory stick, English
- Safety manual

3.2 Accessories

3.2.1 Frame Bus Termination

- Frame Bus terminating for matching the end of the framebus. The framebus, an internal bus system, is used for control EM Test devices and work as daisy chain between the equipment. Longer bus systems must be terminated with a Frame bus termination.

3.3 Options

- **Measuring Module**
  2 Channel Measuring module for frequency selected voltage and current measuring

- **User software " AutoWave.control "**
  - Test, analysis and documentation with windows
  - License version for testing according the most industrial standards
  - Report generator with export function to word-processing software

- **CN 200N Series**
  Transformer assembly

- **Radiating Loop and Loop Sensor**
  RL_120: - Radiating loop as per MIL –STD 461-E 120mm, 20 turns
  - cable 3m with banana plugs

  LS_040: - Loop sensor as per MIL –STD 461-E 40mm, 51 turns
  - cable 3m with BNC / speakon plugs

- **MN-HField matching resistor**
  for attenuate the antenna current for reduce the H-field strength.
  With the short circuit bridge the user short the internal resistor for full output current to the Antenna.
  Switch position = 1(short circuit) for levels > 1A/m

- **C-Box H-Field (AMP 200N2 Only)**

  For magnetic immunity testing using select Helmholtz coils, an optional C-Box H-Field is available. This is a capacitor box with selectable capacitance values used to adjust the resonance point with supported coil can be driven in resonance to achieve high field strengths. Compatible with HCS_50/28_B Helmholtz coil for level ISO 11452-8 Level I - IV External and Level I - III Internal. When this coil is chosen, a dialog to use the C-Box H-Field is provided. autowave.control will prompt the user to select the appropriate range on the C-Box.

4 Operating Functions AMP200N

4.1 Front view

Figure 1

1. TEST ON
2. LED Power
3. LED Fail
4. Measuring input
5. Measuring input enabled
6. 2 wire output indication
7. 2 wire output
8. Coaxial output
9. Coaxial output indication
10. Current clamp input enabled
11. Current clamp input

1 Test ON
Test On button for enable the output of the amplifier. The input signal of the amplifier will be grounded. The test ON button can be switch on after power up (the power LED is on, no blinking).

2 LED Power
Power On Indication of the present mains power. The illuminated LED shows the power on status.

3 LED Fail
Indication of different Fail status of the AMP 200 as:
Overtemperature, Overload, internal Fail, Safety Circuit
Fail Reset: Press **OK** in the software Fail window, wait 2 seconds and press AMP200 **Test ON** button.

4 Measuring Input
Measuring input of the frequency selected voltmeter.
Input range: Max. 200V pk-pk; Frequency range: 10Hz to 250kHz

5 Measuring input indication
LED indication for active measurement.

6 2 wire output indication
LED indication for use the 2-wire output plugs (Flashing).

7 2 wire output
Output 4mm banana plugs for the signal from the amplifier. (The 2-wire and coaxial outputs are always in parallel).

8 Coaxial output
Output 4N-connector type for the signal from the amplifier. (The 2-wire and coaxial outputs are always in parallel).

9 Coaxial output indication
LED indication for use the coaxial output. (Flashing).

10 Current clamp input indication
LED indication for the enabled current clamp measurement (Flashing).

11 Current clamp input
BNC input of the frequency selected current clamp measurement.
Input range Max. 10V pk-pk ; Frequency range :10Hz to 250kHz

4.2 Rear view

ATTENTION

Attention: For cooling the AMP200N a minimum free space at the rear of 20cm is requested

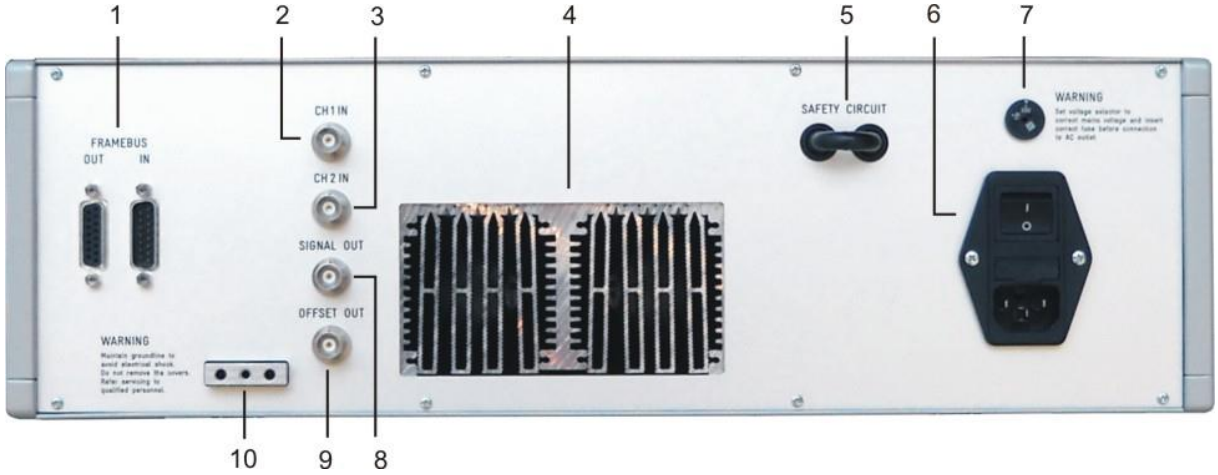


Figure 2

1	Framebus	6	Power on switch with fuse
2	CH 1 IN	7	Mains selector 115V / 230V
3	CH 2 IN	8	Signal OUT
4	Ventilation	9	Offset OUT
5	Safety Circuit	10	Reference Earth connection

1 Frame Bus
Daisy Chain bus with Sub D 15 poles male and female connectors. This port is used as communication and control bus between EM Test devices. A framebus terminating network is mandatory when the AMP 200Nx is at the end of the daisy chain.

2 CH 1 IN
BNC input -10V to +10V: This input is used for controlling the VDS 200 or internal amplifier. In switch off Status the connection is passing to the Signal out output.

3 CH 2 IN
BNC input -10V to +10V to internal amplifier.

4 Ventilation
The cooling output needs at least 20cm space for a free airflow.

5 Safety Circuit
The Safety Circuit is a 12V loop who switches off the power supply of the amplifier. The ac voltage will be interrupted by a relays.

Attention: After open the Safety circuit there is still same energy in the storage capacitors of the amplifier.

6 Power on switch with mains fuse
The switch is part of the mains filter. Mains fuses are part of the filter. (230V / 3.15AT and 115V / 6AT). After switch on the power LED is flashing few seconds, till the AMP200 is ready for use.

7 Mains selector
Selection of 115V / 230V

8 Signal OUT
Control output to system dc source (normally VDS200N). The control signal is generated in the AutoWave or AMP 200 internal and pass through the AMP200N to the “analog IN” of the VDS200N.

9 Offset OUT
Output control signal from the AMP 200N internal DC source (-10V to +10V).

10 Reference earth connection

The generator has to be connected to the reference earth plane of the test set up.

5 Operating Functions AMP200N1.1 and AMP 200N2

5.1 Front view

Figure 3

1. TEST ON
2. LED Power
3. LED Fail
4. Measuring input
5. Measuring input enabled
6. 2 wire output indication
7. 2 wire output
8. Coaxial output
9. Coaxial output indication
10. Current clamp input enabled
11. Current clamp input

1 Test ON
Test On button for enable the output of the amplifier. The input signal of the amplifier will be grounded. The test ON button can be switch on after power up (the power LED is on, no blinking).

2 LED Power
Power On Indication of the present mains power. The illuminated LED shows the power on status.

3 LED Fail
Indication of different Fail status of the AMP 200N, such as:
Overtemperature, Overload, internal Fail, Safety Circuit
Fail Reset: Press **OK** in the software Fail window, wait 2 seconds and press AMP200N **Test ON** button.

4 Measuring Input
Measuring input of the frequency selected voltmeter.
Input range: Max. 200V pk-pk; Frequency range: 10Hz to 250kHz

5 Measuring input indication
LED indication for active measurement.

6 2 wire output indication
LED indication for use the 2-wire output plugs (Flashing).

7 2 wire output
Output 4mm banana plugs for the signal from the amplifier. (The 2-wire and coaxial outputs are always in parallel).
LED indication for use the coaxial output. (Flashing).

Figure 4

1. TEST ON
2. LED Power
3. LED Fail
4. Measuring input
5. Measuring input enabled
6. 2 wire output indication
7. 2 wire output
8. Coaxial output
9. Coaxial output indication
10. Current clamp input enabled
11. Current clamp input

8 **Coaxial output**
Output 4N-connector type for the signal from the amplifier. (The 2-wire and coaxial outputs are always in parallel).

9 **Coaxial output indication**
LED indication for use the 2-wire output plugs (Flashing).

10 **Current clamp input indication**
LED indication for the enabled current clamp measurement (Flashing).

11 **Current clamp input**
BNC input of the frequency selected current clamp measurement.
Input range Max. 10V pk-pk ; Frequency range :10Hz to 250kHz

5.2 Rear view

ATTENTION

Attention: For cooling the AMP200N a minimum free space at the rear of 20cm is requested

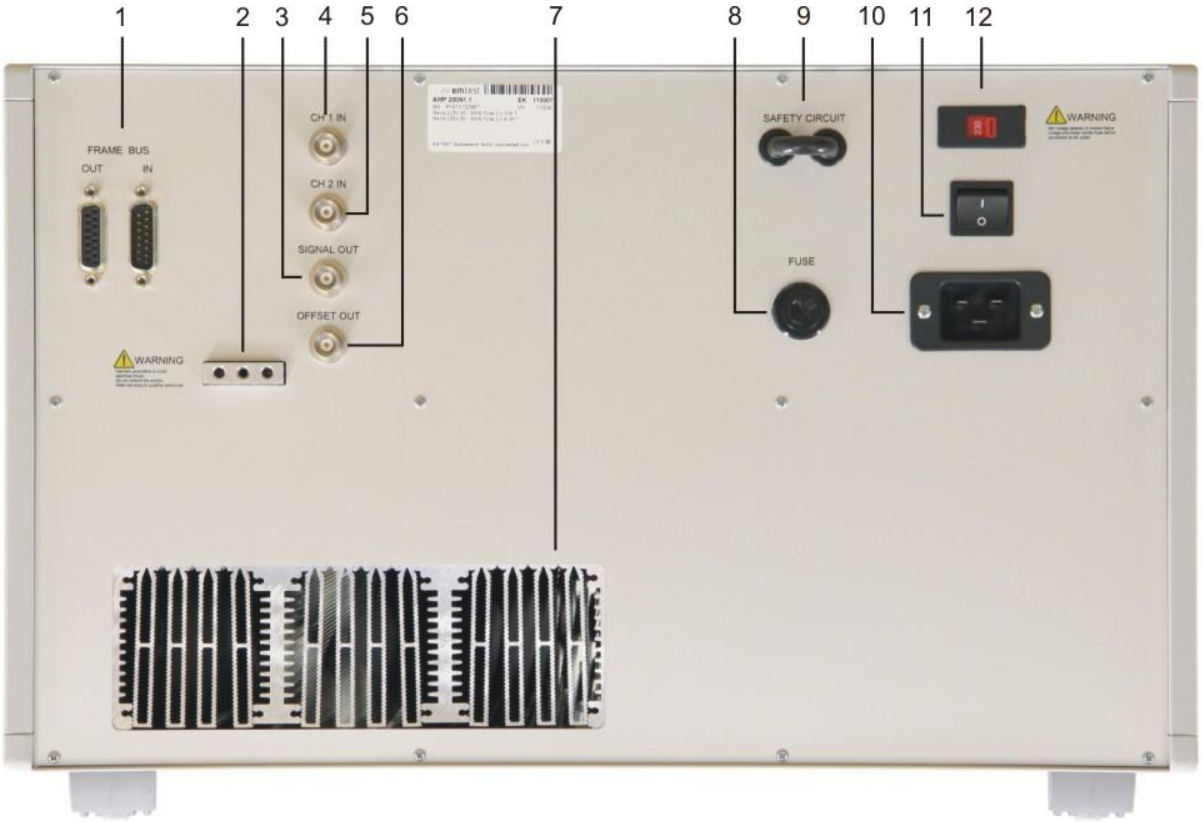


Figure 5

1	Framebus	7	Ventilation
2	Reference earth connection	8	Mains Fuse
3	Signal OUT	9	Safety Circuit
4	CH 1 IN	10	Mains input
5	CH 2 IN	11	Power on switch
6	Offset OUT	12	Mains selector 115V / 230V

1 Frame Bus
Daisy Chain bus with Sub D 15 poles male and female connectors. This port is used as communication and control bus between EM Test devices.

2 Reference earth connection
The generator has to be connected to the reference earth plane of the test set up.

3 Signal OUT
Control output to system dc source (normally VDS200N). The control signal is generated in the AutoWave or AMP 200 internal and pass through the AMP200N to the “analog IN” of the VDS200N.

4 CH 1 IN
BNC input -10V to +10V: This input is used for controlling the VDS 200 or internal amplifier. In switch off Status the connection is passing to the Signal out output.

5 CH 2 IN
BNC input -10V to +10V to internal amplifier.

6 Offset OUT
Output control signal from the AMP 200N internal DC source (-10V to +10V).

7 Ventilation
The cooling output needs at least 20cm space for a free airflow.

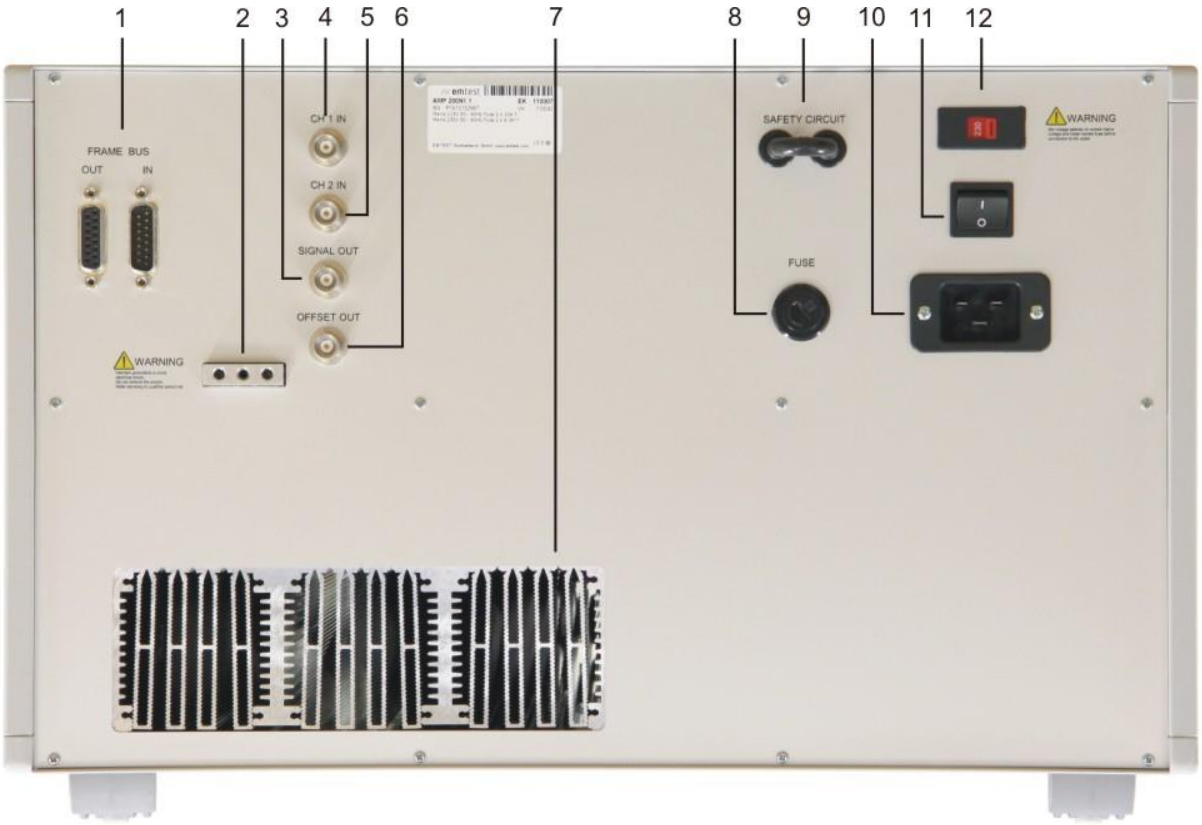


Figure 6

1	Framebus	7	Ventilation
2	Reference earth connection	8	Mains Fuse
3	Signal OUT	9	Safety Circuit
4	CH 1 IN	10	Mains input
5	CH 2 IN	11	Power on switch
6	Offset OUT	12	Mains selector 115V / 230V

8 Mains Fuse

Mains	AMP 200N2	AMP 200N1.1	AMP 200N1
115 V	16 AT	16 AT	2 x 8 AT
230 V	10 AT	10 AT	2 x 4 AT

9 Safety Circuit

The Safety Circuit is a 12V loop who switches off the power supply of the amplifier. The ac voltage will be interrupted by a relays.

Attention: After open the Safety circuit there is still same energy in the storage capacitors of the amplifier.

10 Mains Input

115VAC/230VAC 16A input connector (build in socket: IEC-60320 C20, compatible plug: IEC-60320 C19).

11 Mains Switch

After switch on the power LED is flashing few seconds, till the AMP200 is ready for use.

12 Mains selector

Selection of 115V / 230V

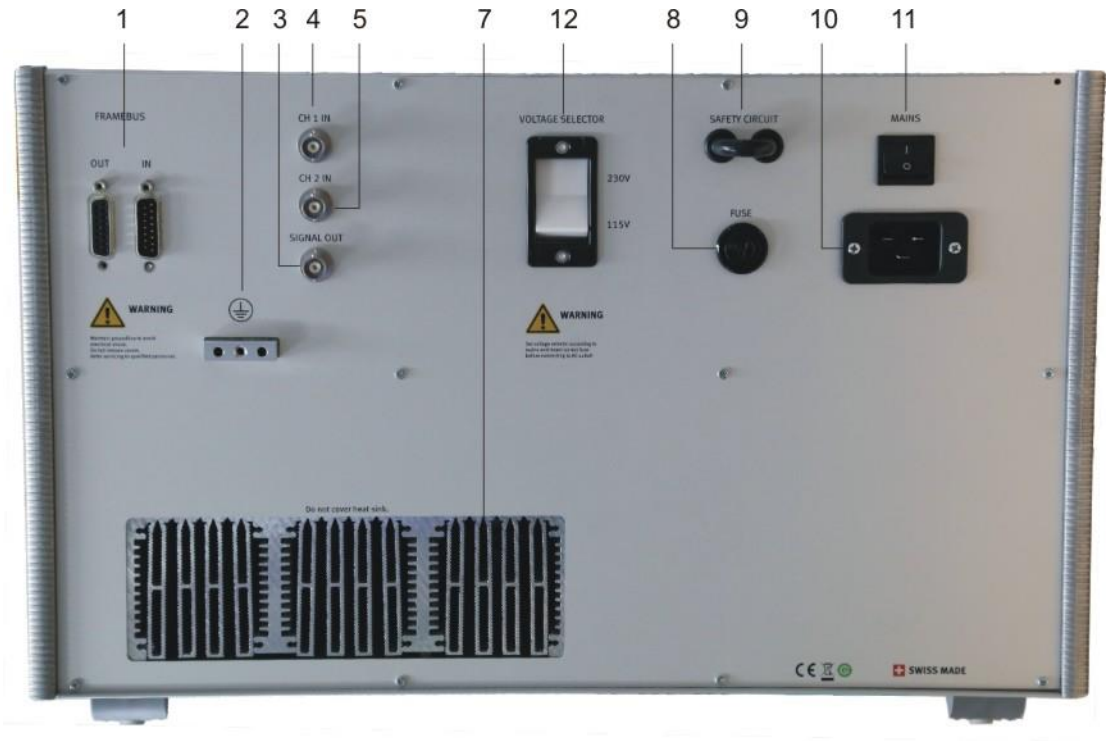


Figure 7

1	Framebus	7	Ventilation
2	Reference earth connection	8	Mains Fuse
3	Signal OUT	9	Safety Circuit
4	CH 1 IN	10	Mains input
5	CH 2 IN	11	Power on switch
6	Offset OUT	12	Mains selector 115V / 230V

See AMP 200N1.1, except SIGNAL OUT. The AMP 200N2: The SIGNAL OUT output is only active when the AMP is turned on.

6 Operation

The AMP 200N needs an **AutoWave generator or a Netwave** for operate. The AutoWave/Netwave generator controls the AMP 200N via the framebus. The user needs the **autowave.control or Netwave.controlsoftware** for operate the system with the AMP200N.

6.1 Test Setup with Autowave

The typical test setup with the control cable connections is illustrate in figure 4.1
For operation with AMP200N the software AutoWave.control is necessary. For device control the following interfaces must be used:

Devices	GPIB	Ethernet
AutoWave AMP200N	X	X
AutoWave AMP200N VDS200x	X	

NOTE: If the user has a device which needs GPIB, (example VDS200x), it is mandatory to use the GPIB interface.

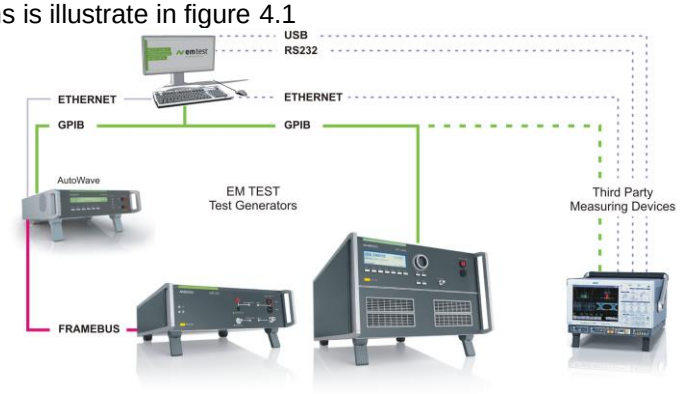


Figure 8 General Test setup with AMP 200N and AutoWave

6.1.1 Cabeling with Autowave

The general cabling with AMP 200N is illustrated in Figure 3.2.

There are many applications that use an AMP200N. Please refer to the setup description in the specific standards.
Chapter Applications shows a selection test setup and their specific software settings for different tests.

List of cable connections:

Computer to…

AutoWave		GPIB / IEEE488 Ethernet
AutoWave & VDS200x		GPIB / IEEE488

AutoWave to AMP 200N

Framebus OUT	Framebus IN	Sub-D 15 poles
CH 1	CH 1 IN	BNC
CH 2	CH 2 IN	BNC

AMP 200N to VDS 200x

Signal OUT	0-10V	BNC

AMP 200N

Framebus OUT	Termination	Sub-D 15 poles

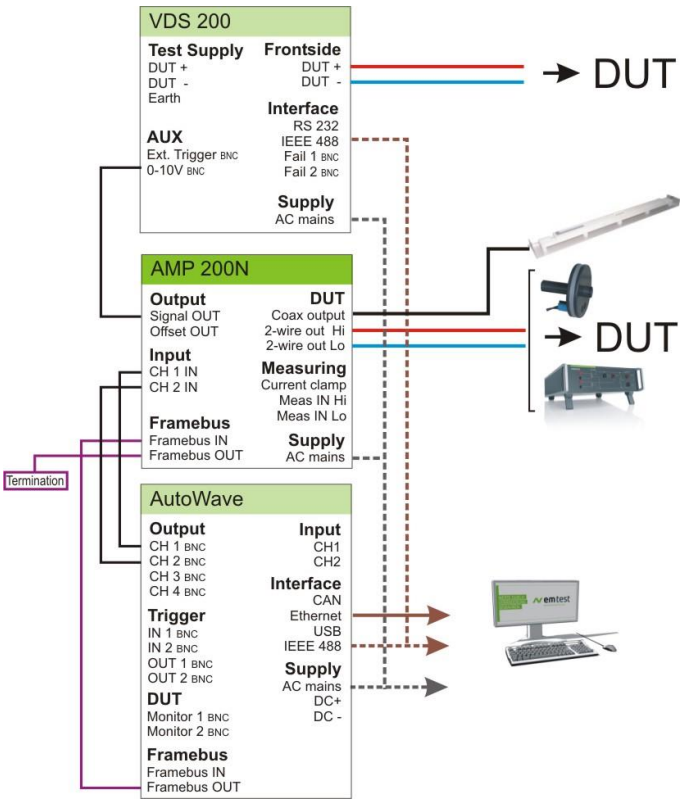


Figure 9 System cabling using AMP 200N

6.2 Test Setup and cabeling with Netwave and AMP200N Series

The typical test setup with the control cable connections is illustrate in figure 4.3

For operation with AMP200N Series the software Netwave.control is necessary. The AMP200N is controlled via the Framebus interface from the Netwave.

The NetWave is computer controlled via GPIB or Ethernet interface.

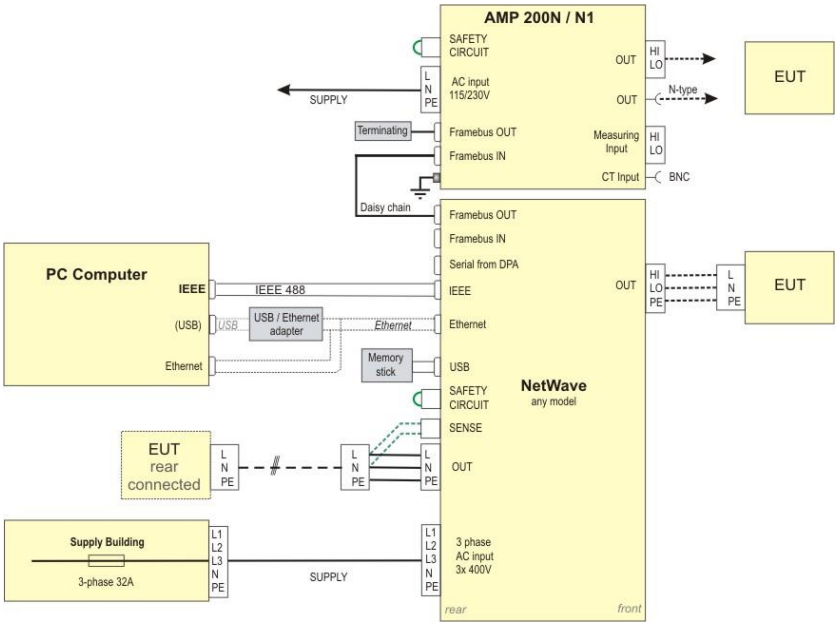


Figure 10 General Test setup with Netwave and AMP 200N/N1

6.3 Output Range setting for DC application

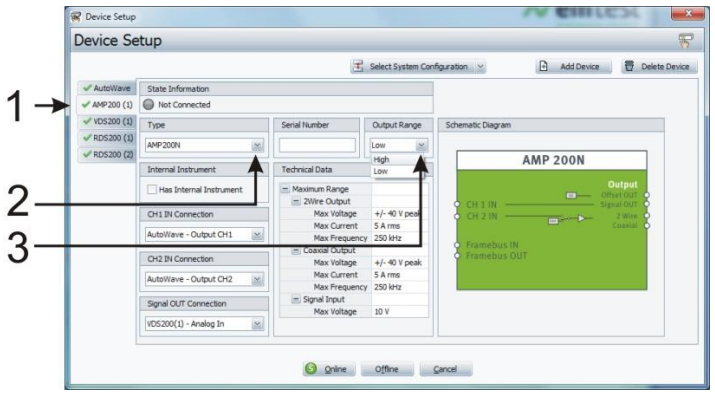
The AMP 200N is a **class A amplifier** with two output ranges with the following output specifications:

Range	max. current	**LOW**	**MED**	**HIGH**
AMP 200N	Imax	±35Vp/5.0A		±70Vp/2.5A
AMP 200N1	Imax	±35Vp/16.0A		±70Vp/8.0A
AMP 200N2	Imax	±25Vp/18.0A	±55Vp/14.0A	±80Vp/10.0A

The output Range selection must be made in the **Device Setup** of the Autowave software.

How to change the Output Range:

1. Select in the Device Setup the AMP200N
2. Select the AMP200N model
3. Select in the Area Output Range the correct range. For the most application the **LOW range** with a maximal current is the best choice.



6.3.1 AMP 200Nx as DC source

It is generally not recommended to use the AMP 200N series as a DC source, but if necessary, it is recommended to check in advance the equipment maximum current consumption during the test. Then **select the suitable output range** for equipment operation. Please take care to the circumstance that the maximum peak or inrush current must be inside the current specification. Otherwise an alarm will occur and the AMP200N will stop and prompt an error message.

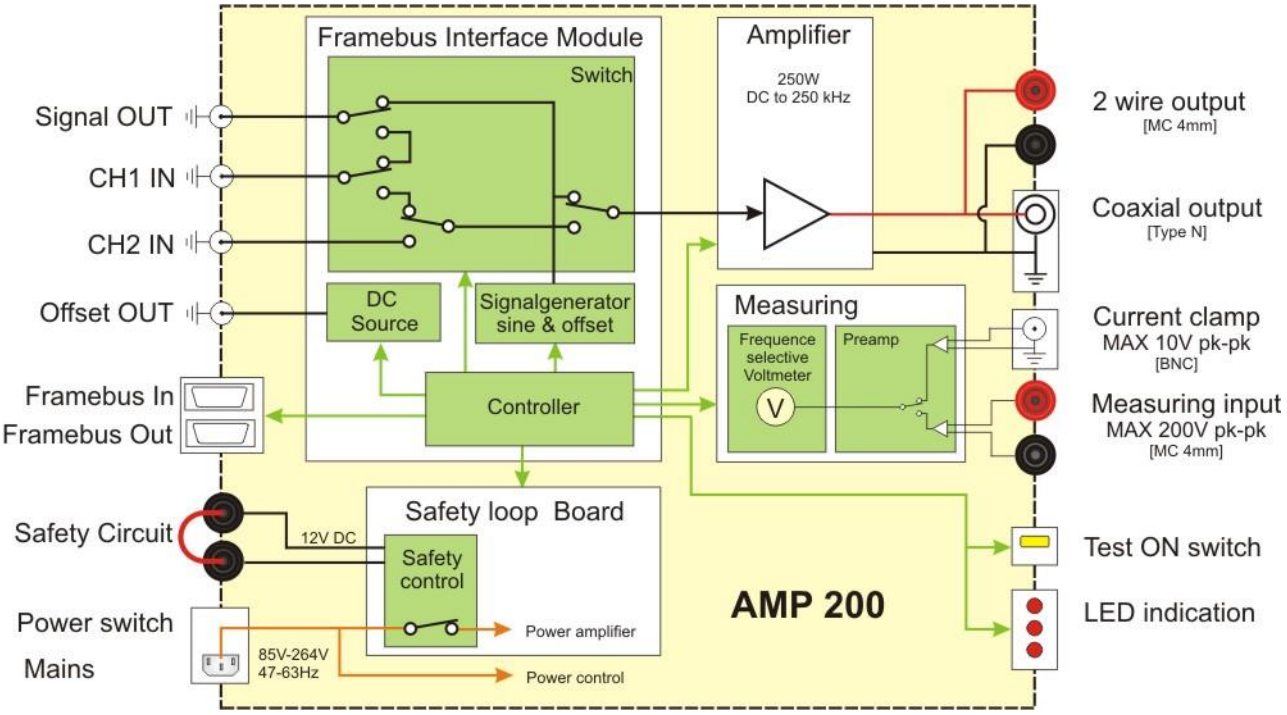
NOTE

Overcurrent alarm appears when DUT current exeeds **Imax !**

AMP 200N is **only suitable as DC** source when **DUT current consumption is < Imax** under all conditions (Inrush, overshoot, peak, transient current). Even µs overcurrent will trip the AMP 200N

7 Test Equipment AMP 200N

7.1 Blockdiagram

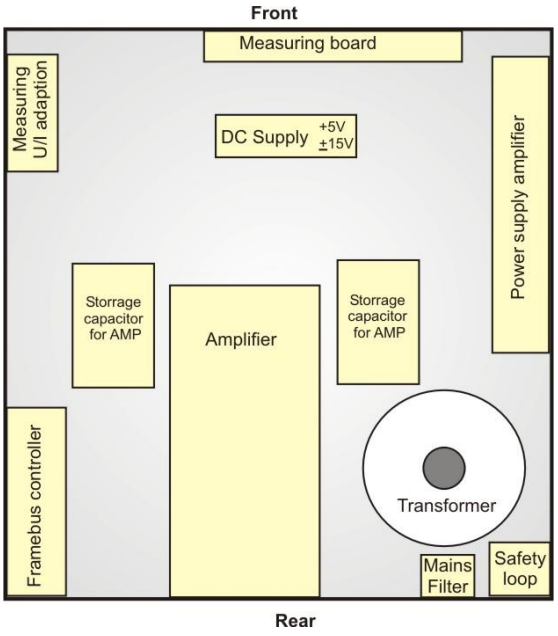


Note: Offset OUT is only supported on some models.

7.2 Construction

The main components of the AMP200N are:

- Framebus controller
- Measuring board
- Measuring U/I Adaption
- Power supply for the amplifier
- DC supply +5V , ± 15V
- Transformer

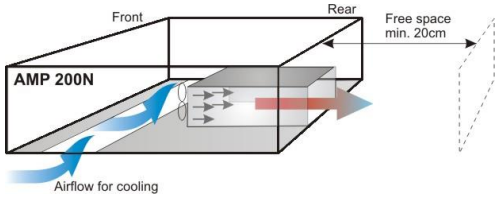


7.3 Cooling

Restriction for cooling behavior.

Rack: No restriction where to install the AMP 200N. The rack internal cooling must be warranted.

Other: For cooling the AMP200N a minimum free space at the rear of 20cm is requested.



7.4 Framebus Interface Module

The framebus interface module with the following blocks:

Controller:	Communication with the AutoWave generator
DC Source:	DC source for the offset Out signal
Signalgenerator:	Generator for the sine signal up to 500kHz. The signal can be shifted by a dc offset.
Switch:	Switch module for switching the two input signals to the internal Amplifier or to the signal out plug.

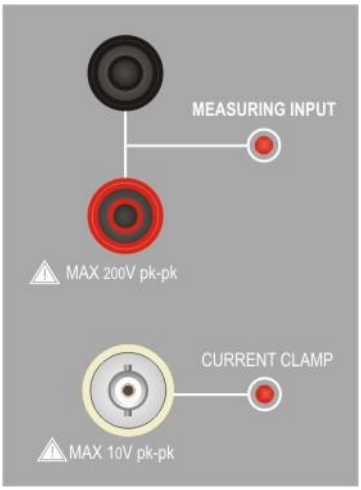
7.5 Amplifier

Linear precision amplifier for all kind of signals. The amplifier is controlled by a microprocessor with sophisticated safety features and equipment. The amplifier is short-circuit proof.
The air cooled amplifier is located in the center of the AMP200N. Two storage capacitors are located on each side of the amplifier module. A separate power unit delivers the necessary supply voltages for the amplifier

7.6 Measuring Board

The measuring module is designed with two different measuring inputs. The instrument is switchable to one of these two inputs.

External measuring input for voltage or current transformer
This external measuring instrument can be selected depends the test application. The measurement is based on a differential measuring between the Hi and Lo input.



Voltage measurement input
Two separate 4mm banana plugs
Voltage measurement max. 100V pk
Input impedance: 260 kΩ

The LED indicates the active measurement input.

Current transformer input
BNC plug for connection to a current transformer.
Max input voltage: 10V pk-pk
Range with 10mV/A : [1mA to 30A]
100mV/A [10mA to 300A]
Range setup in Autowave.control software
Input impedance: 400 kΩ

The LED indicates the active measurement input.

Specs: External differential input

Measuring range	1.5mV to 6.3A (effective)
Frequency range	10Hz to 250kHz
Accuracy	< 5%

Attention: Before using external current clamp make sure that the dc offset is adjusted to zero. This can be done with a scope measurement.

8 Technical data AMP200N

8.1 Amplifier output characteristics

Frequency range	DC – 250 kHz	
Signal power	250 W (nominal)	
Power dissipation amplifier	250 W (maximum)	
Output voltage	HIGH range:	50 V rms, max. ± 70V peak up to 100 kHz
		30 V rms, max. ± 42V peak 100 kHz to 250 kHz
	LOW range:	25 V rms, max. ± 35V peak up to 100 kHz
		15 V rms, max. ± 21V peak 100 kHz to 250 kHz
Output current	HIGH range:	Max. 2.5 A rms
	LOW range:	Max. 5.0 A rms
Harmonic Distortion (THD)	< 0.1%	
Output Impedance	30 mΩ @1 kHz	
Current protection	Short circuit protected	
Overtemperature protection	integrated into amplifier	

8.2 Signal generator output characteristics (built in)

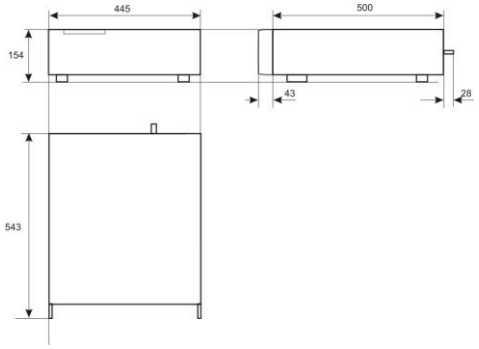
Frequency range	DC, 10 – 250 kHz (sinusoidal)
Output voltage	±10 V
Dc offset	±10 V, programmable, to control external DC amplifier

8.3 Measurements (optional)

Measuring Unit AMP 200N	Frequency-selective instrument for voltage, current and magnetic field
Frequency range	10 Hz – 250 kHz
Accuracy	Better than 5%
Current measurement	External with current clamp Range 100 mV/A: 1 mA – 30 A rms Range 10 mV/A: 10 mA – 300 A rms
Voltage measurement	17 mV – 70 V rms
Magnetic field	Use voltage input for loop senso measuringr

8.4 General

Dimension 19", 3 HU (500mm x 449mm x 133mm)



Weight	18.3 kg
Supply voltage	115 V +10/-2%, 50/60 Hz or 230 V +10/-15%, 50/60 Hz
Input power	Max. 500 W
Inrush current (power ON)	60 A pk-pk
Fuses	2 x 6 AT (115V) 2 x 3.15 AT (230V)
Cooling	Active cooling, air ventilation
Temperature	10°C - 40°C
Humidity	20 to 85% relative humidity (RH non condensing)

9 Technical data AMP200N1.1

9.1 Amplifier output characteristics

Frequency range	DC – 500kHz	
Signal power	800 W (nominal)	
Power dissipation amplifier	800 W (maximum)	
Output voltage	HIGH range:	50 V rms, max. ± 70 V peak up to 100 kHz
		30 V rms, max. ± 42 V peak 100 kHz to 250 kHz
	LOW range:	25 V rms, max. ± 35 V peak up to 100 kHz
		15 V rms, max. ± 21 V peak 100 kHz to 250 kHz
Output current	HIGH range:	Max 8.0 A rms
	LOW range:	Max. 16.0 A rms
DC current (for magnetic field tests)	25 A	
Harmonic Distortion (THD)	< 0.1%	
Output Impedance	30 mΩ @1 kHz	
Current protection	Short circuit protected	
Overtemperature protection	integrated into amplifier	

9.2 Signal generator output characteristics (built in)

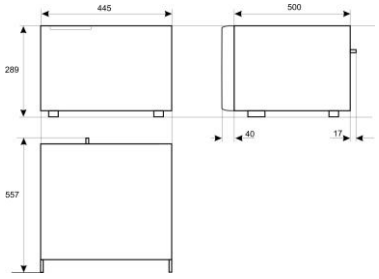
Frequency range	DC, 10 – 250 kHz (sinusoidal)
Output voltage	±10 V
Dc offset	±10 V, programmable, to control external DC amplifier

9.3 Measurements (optional)

Measuring Unit AMP 200N	Frequency-selective instrument for voltage, current and magnetic field
Frequency range	10 Hz – 250 kHz
Accuracy	Better than 5%
Current measurement	External with current clamp Range 100 mV/A: 1 mA – 30 A rms Range 10 mV/A: 10 mA – 300 A rms
Voltage measurement	17 mV – 70 V rms
Magnetic field	Use voltage input for loop sensor measuring

9.4 General

Dimension 19", 6 HU (500mm x 449mm x 267mm)



Weight	36.1kg
Supply voltage	115 V +10/-2%, 50/60 Hz or (**min 112 V**) 230 V +10/-15%, 50/60 Hz
Input power	Max. 1000 W
Inrush current (power ON)	60 A pk-pk
Fuses	AMP 200N1.1 115 V: 16 AT, 230 V: 10 AT
Cooling	Active cooling, air ventilation
Temperature	10°C - 40°C
Humidity	20 to 85% relative humidity (RH non condensing)

10 Technical data AMP200N2

10.1 Amplifier output characteristics

Frequency range	DC – 500kHz	
Signal power	1000 W* (nominal)	
Power dissipation amplifier	1000 W (maximum)	
Output voltage	HIGH range:	±80Vp/
	MED range:	±55Vp/
	LOW range:	±25Vp/
Output current	HIGH range:	Max. 10.0A rms
	MED range:	Max. 14.0A rms
	LOW range:	Max. 18.0A rms
DC current (for magnetic field tests)	25 A	
Harmonic Distortion (THD)	< 0.1%	
Output Impedance	30 mΩ @1 kHz	
Current protection	Short circuit protected	
Overtemperature protection	integrated into amplifier	

*DC into a 4 Ω load.

10.2 Signal generator output characteristics (built in)

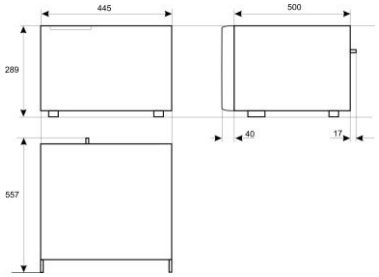
Frequency range	DC, 10 – 500 kHz (sinusoidal)
Output voltage	±10 V
Dc offset	±10 V, programmable, to control external DC amplifier

10.3 Measurements (optional)

Measuring Unit AMP 200N	Frequency-selective instrument for voltage, current and magnetic field
Frequency range	10 Hz – 250 kHz (External oscilloscope must be used to measure beyond 250 kHz)
Accuracy	Better than 5%
Current measurement	External with current clamp Range 100 mV/A: 1 mA – 30 A rms Range 10 mV/A: 10 mA – 300 A rms Max. 10 Vpp
Voltage measurement	17 mV – 70 V rms, max. 200 Vpp
Magnetic field	Use voltage input for loop sensor measuring

10.4 General

Dimension	19", 6 HU	(500mm x 449mm x 267mm)



Weight	40 kg		
Supply voltage	115 V +10/-2%, 50/60 Hz or (**min 112 V**)		
	230 V +10/-15%, 50/60 Hz		
Input power	Max. 1000 W		
Inrush current (power ON)	60 A pk-pk		
Fuses	AMP 200N1:	115 V: 2 x 8 AT,	230 V: 2 x 4 AT
	AMP 200N1.1	115 V: 16 AT,	230 V: 10 AT
Cooling	Active cooling, air ventilation		

Temperature	10°C - 40°C
Humidity	20 to 85% relative humidity (RH non condensing)

11 Maintenance

11.1 General

The AMP 200N series is absolutely maintenance-free

11.2 Calibration and Verification

11.2.1 Factory calibration

Every AMETEK CTS 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 AMETEK CTS 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

11.2.2 Guideline to determine the calibration period of AMETEK CTS instrumentation

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

AMETEK CTS 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:
AMETEK CTS 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 must be defined based on two criteria:

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

- Based on the experience and observation collected over the years **AMETEK CTS 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.

11.2.3 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.

11.2.4 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, AMETEK CTS suggests refer to the waveshape and values of the original calibration certificate.

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

12 Application

The AMP 200N is a multi using instrument with a large number of applications. In general the AMP 200N can be used for the following two groups of application:

A : **Immunity tests**
Different devices like Radiating loop or Coupling Network (CN200) are connected to the Test supply output. Therefore it is mandatory to use the AMP 200N set the output voltage to 0V

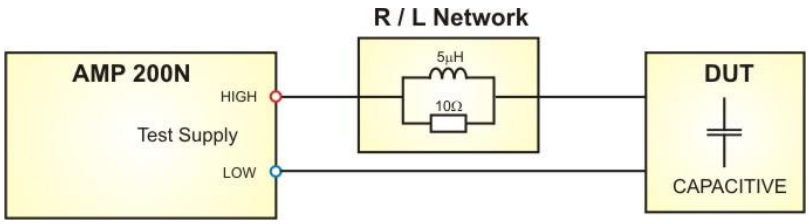
B: **DC source**
The AMP 200N is used as an additional DC source with the alternator voltage 13.5V or higher voltage..

Output Range
The AMP 200N series has as class A amplifier two. See technical specifications for the various models.

12.1 Using Capacitive loads

AMP 200N

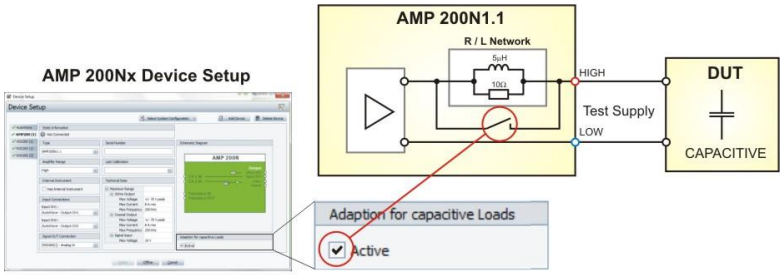
An additional L/R Network, L5uH parallel 10Ω, is proposed to connect in series to the AMP200 output. This netwok will prevent the swinging of the AMP regulation control.



AMP 200N1.1

The AMP 200N1.1 has already built in the L/R networkinside the device.
Use the software **Device Setup** for activate the R/L Network

NOTE: Upgraded *AMP 200N with firmware V3.00.00 and higher may have also a built in R/L Network*

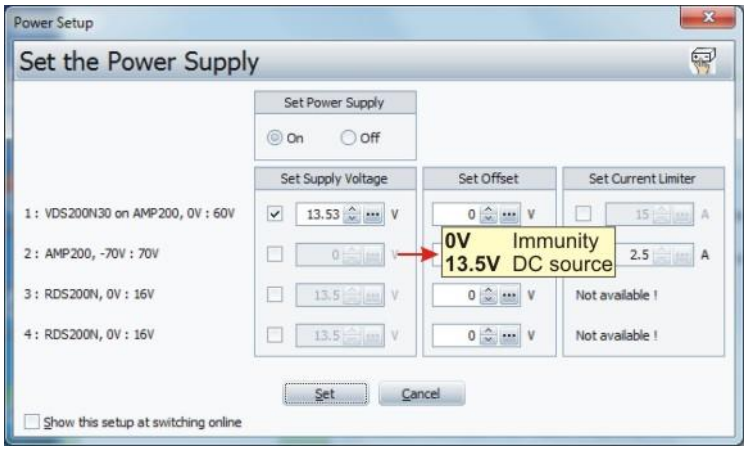


NOTE: *The R/L Network is no longer supported by the AMP 200N2.*

12.2 Power setup AMP 200Nx

Application	Power Setup	Remark
Immunity Test	0V	Check output voltage before connect any devices
DC source	13.5V	

Power setup when using the AMP 200N for immunity tests and using as dc source.



12.3 Test setup for AMP 200N Series application

The following setup shows different setup with EM Test devices for testing with AMP200N. The list is not complete.

Setup 5:
example with:

Rack
LD 200N

AMP 200N
AutoWave

UCS 200N
VDS 200Nx

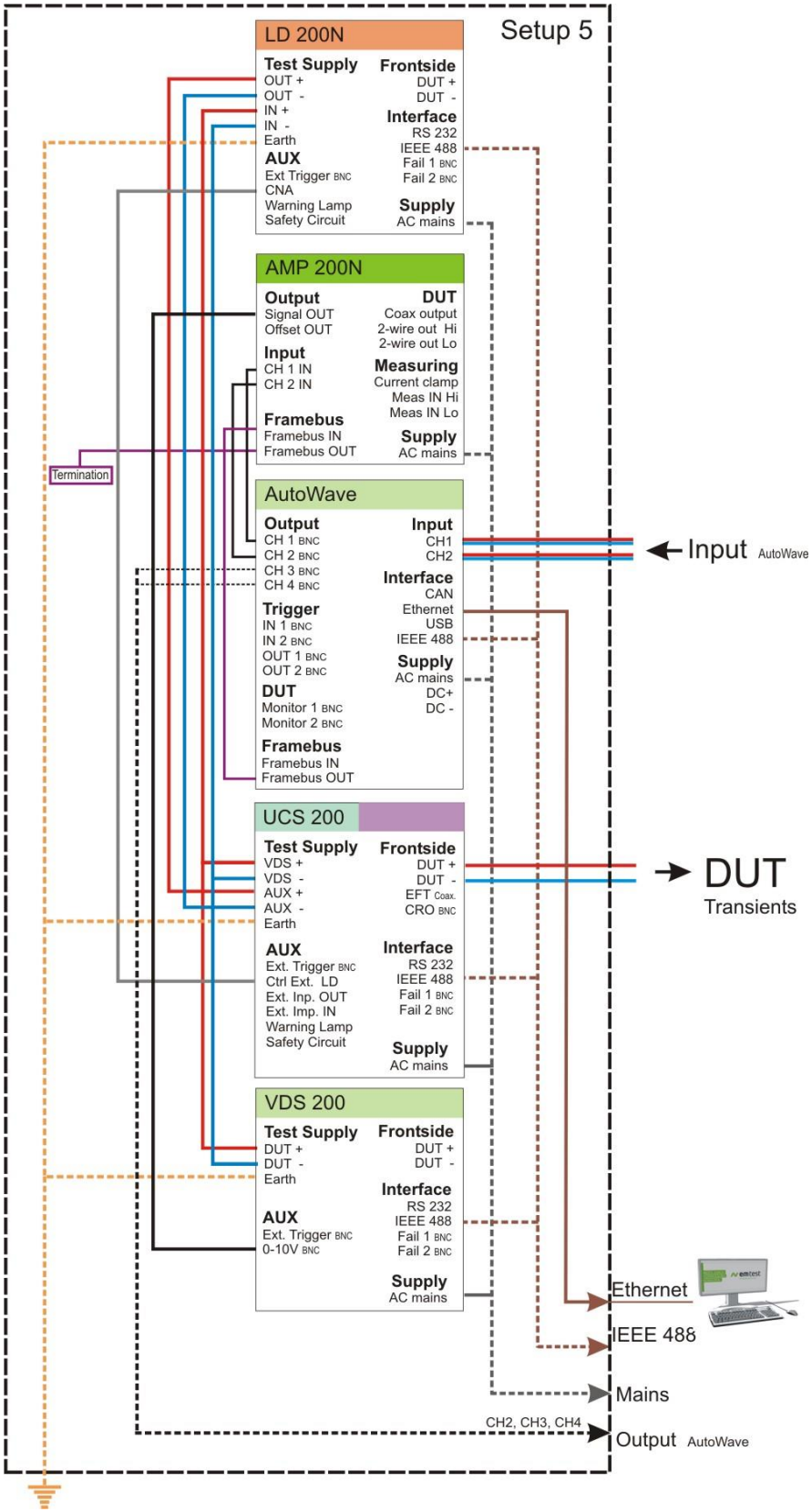


Figure 11 Setup 5

Setup 6:
example with:

Rack
LD 200N

AMP 200N
AutoWave

PFS500N
RDS200

UCS 200N
VDS 200Nx

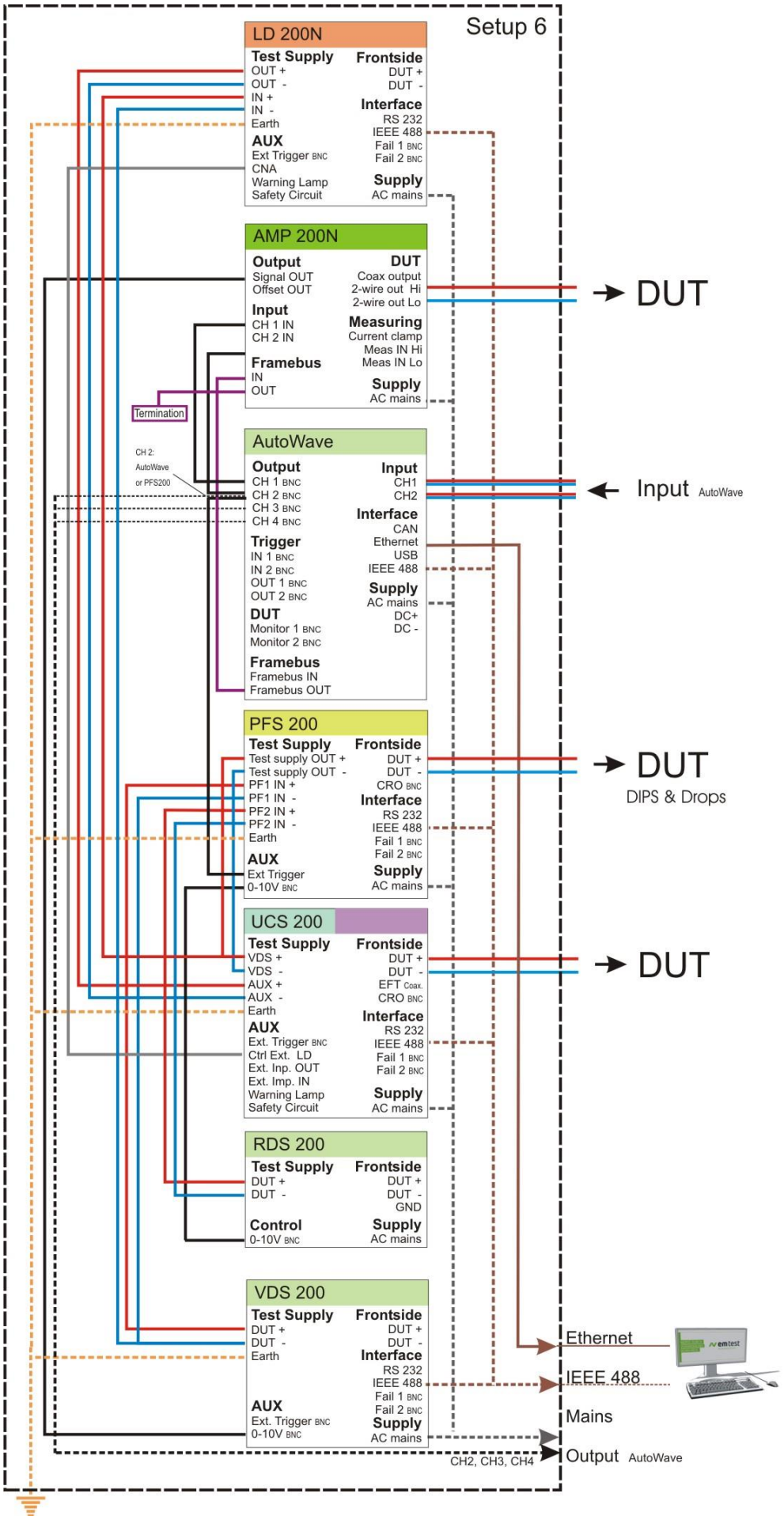


Figure 12 Setup 6

12.4 Setup for Ford EMC CS 2009-1

These requirements are related to component immunity from wire-to wire coupling of unintended transient disturbances. The originate of these disturbances are from switching of inductive loads including solenoids and motors.

Standard setup as per Ford

For complete transient testing as per Ford standard, the following setup shows the wiring between the different EM Test devices.

Rack 1 DC sources

RDS 200
RDS 200
RDS200

AMP 200N
AutoWave

PFS 200N
VDS 200N

Rack 2 Pulses

LD 200N
UCS 200N

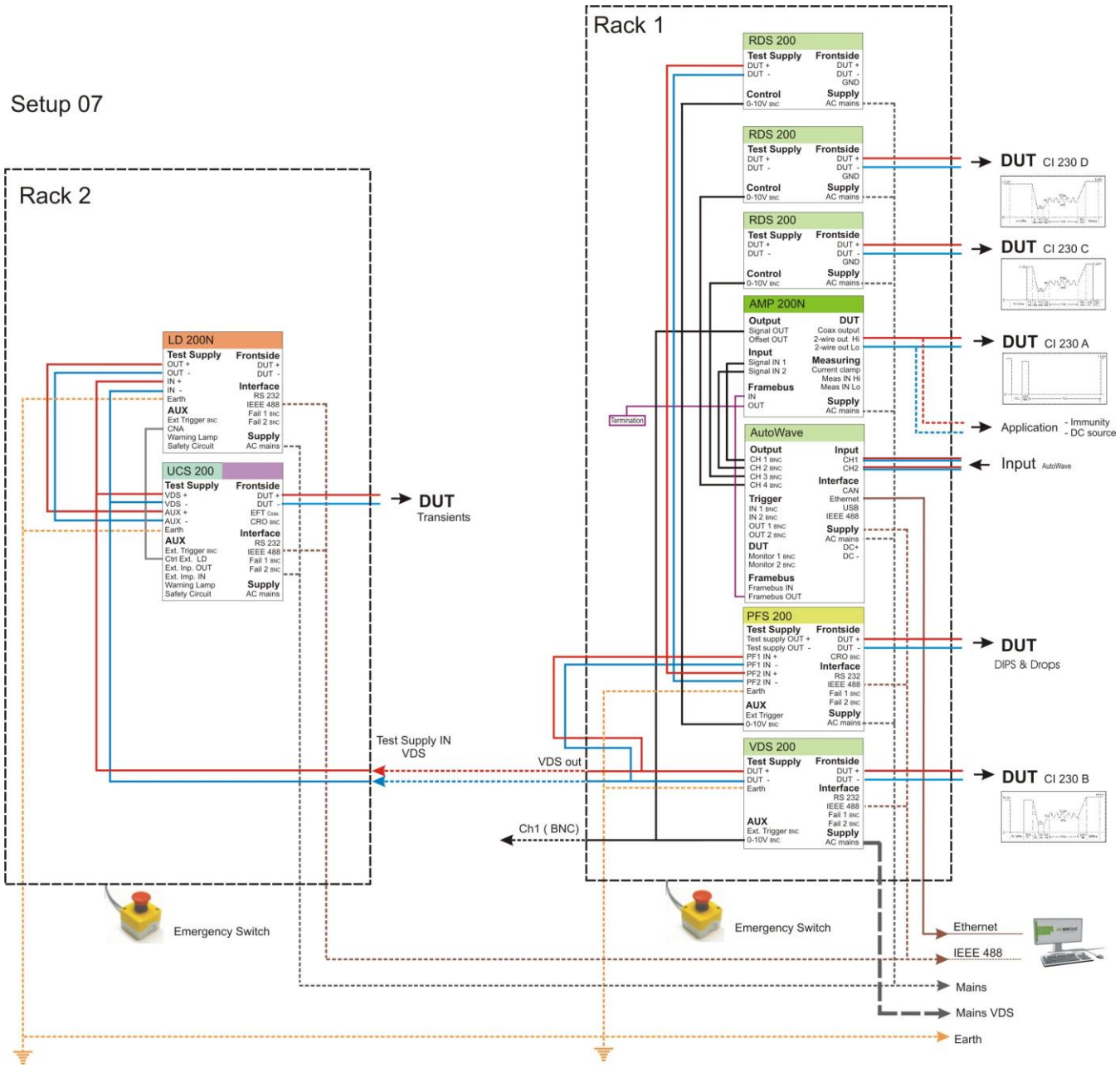


Figure 13 Setup 7

Standard setup as per Ford

For complete transient testing as per Ford standard, the following setup shows the wiring between the different EM Test devices.

Rack 1 DC sources

RDS 200N *control: AutoWave CH4 or PFS200*
RDS 200N *control: AutoWave CH3*

AMP 200N
AutoWave

PFS 200N
VDS 200N

Rack 2 Pulses

LD 200N
UCS 200N

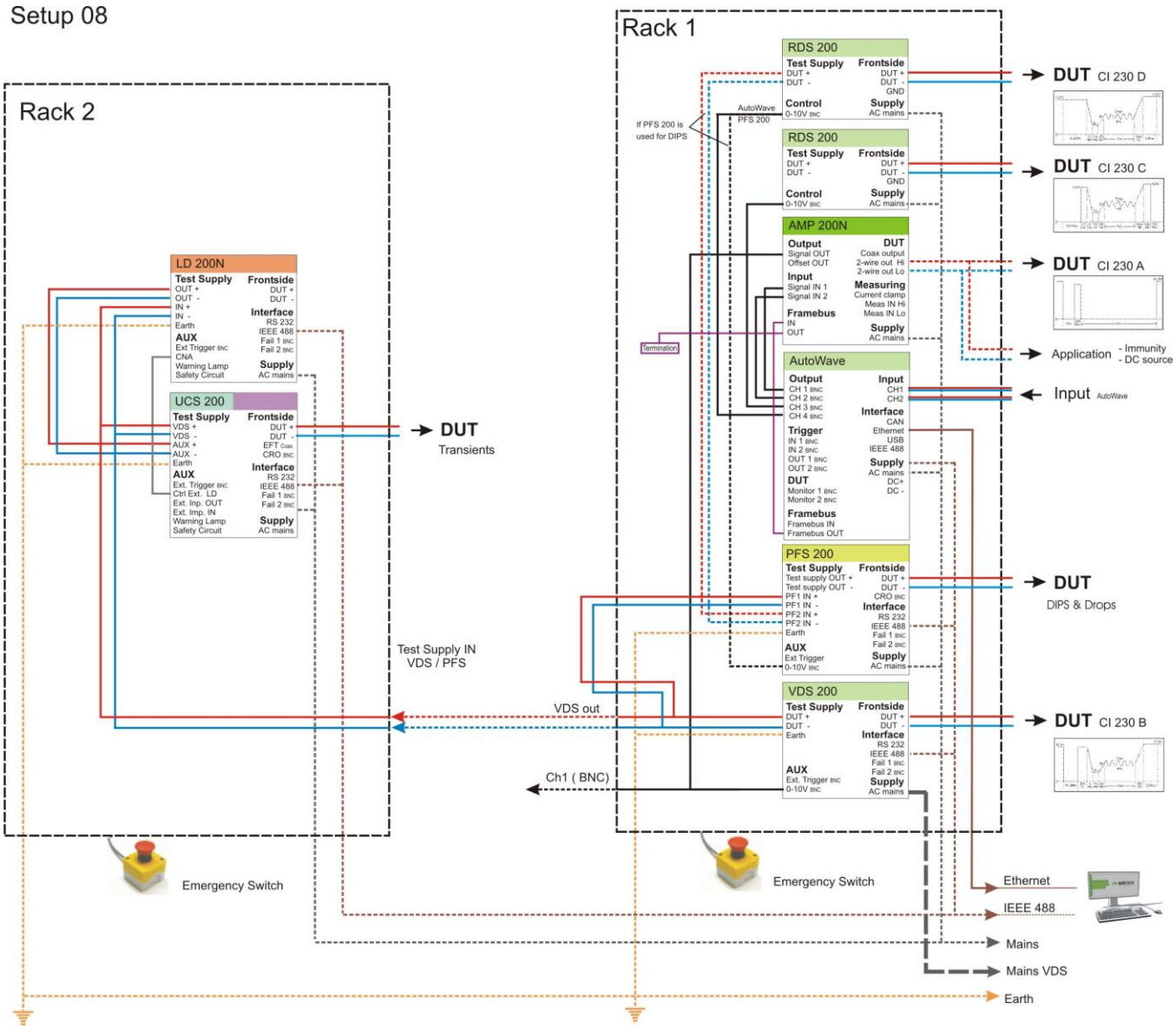


Figure 14 Setup 8

Remark: Control cable for RDS200
Ford CI 230 **RDS200**: analog in 0-10V to **AutoWave** CH4
PFS 200 application **RDS200**: analog in 0-10V to **PFS200** 0-10V

12.4.1 Setup for Magnetic Field Immunity: RI 140

Magnetic field immunity requirements cover the frequency range from 50 Hz to 100 kHz. Requirements are based on anticipated “off-vehicle” electromagnetic sources (e.g. AC power lines) in addition to “on-vehicle” sources (e.g. charging system, PWM sources)

Default test setup

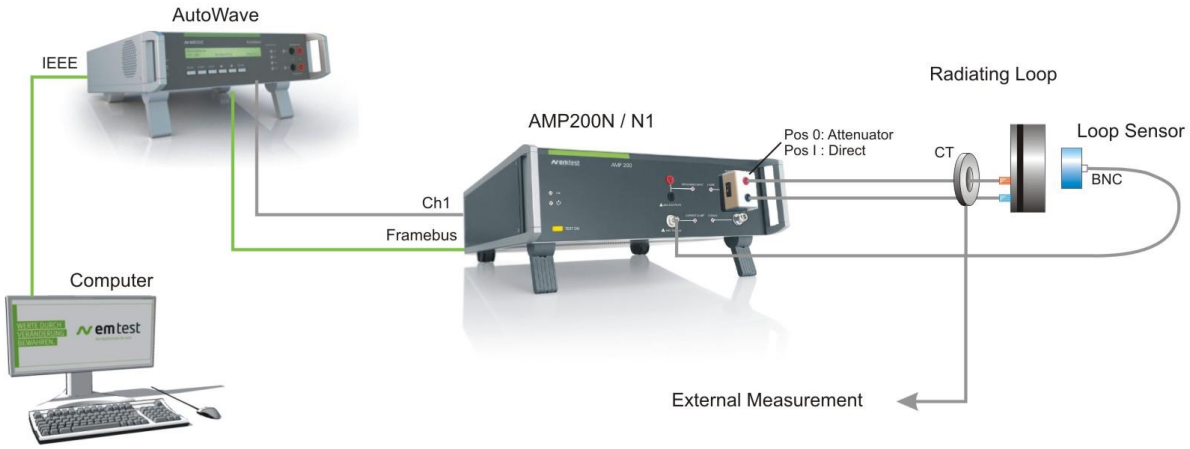


Figure 15 Setup for RI 140 If MN HField box is used the bridge must be shorted

RI 140 Test Parameter requirements

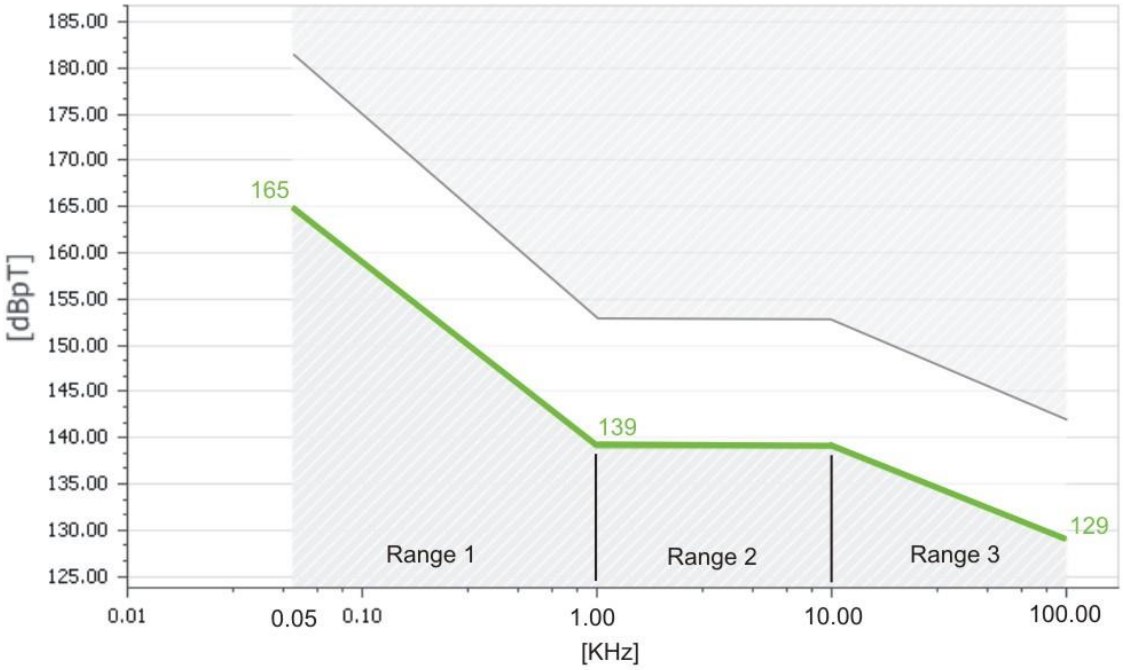


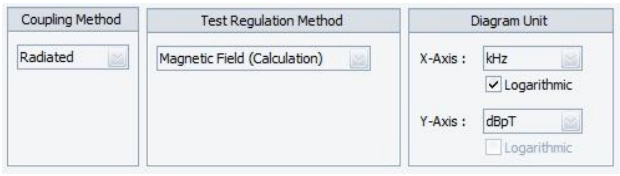
Figure 16 Graph for RI 140

Range	Frequency [kHz]	Level [dBpT rms]	Frequency step [kHz]
Range 1	0.05 – 1	165 – 20 log (f/0.05)	0.05
Range 2	1 – 10	139	0.5
Range 3	10 - 100	139 – 20 log (f/10)	5

Test characteristics Default settings as per Standard

Method:

Coupling Method : Radiated
Test Regulation Method: Magnetic field (Calculation)
Diagram Unit X-Axis : kHz ; Log
Y-Axis: dBpT



Tolerances

Tolerances : +10% -0%

Additional Settings:
Additional Level Offset 0V
Level Change at next Testpoint: -3dB

User Software settings for adapt the hardware

The user has to complete the test settings with his individual used coupling and measuring devices. New coupling devices can be installed in the menu **Setup/Coupling Device** by the user.

Coupling

Coupling Type Antenna

Coupling Device Radiating Loop

A: Coupling Device:

Selectable 120mm Radiating Loop or a Helmholtz Coil from default list:

Radiating Loop
Radiating Loop (RL 120)
Solar 9230-1
ETS Lindgreen 6703
Schwarzbeck FESP 5132

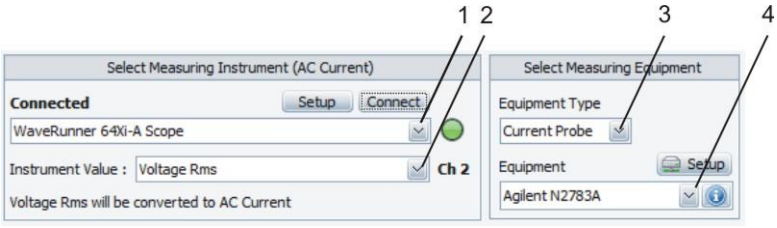
Helmholtz Coils
Not available

Setup for add or modify new Antennas in the Library in the Setup Coupling Devices
⇨ For more information refer to the Autowave software manual.

Current Measuring on Channel 2:

Measuring Instrument (AC current)
1. Instrument Scope model
2. Instrument value Voltage rms

Measuring Equipment
3. Equipment Type Current Probe
4. Equipment Agilent N2783A



B: Current Measuring Instrument:

The current measuring is realized with a current probe connected to a measurement receiver. This instrument will measure the transferred ac voltage. The selected AC current instrument must be able to measure up to 100kHz

Measurement Instrument	Measuring AC voltage
Scope	LeCroy preferred manufacturer by EM Test
Keitley 2000	
AMP200 Internal Internal	

Connect Instrument
Press **Connect** for check the instrument connection.

Setup : for add or modify an instrument in the library

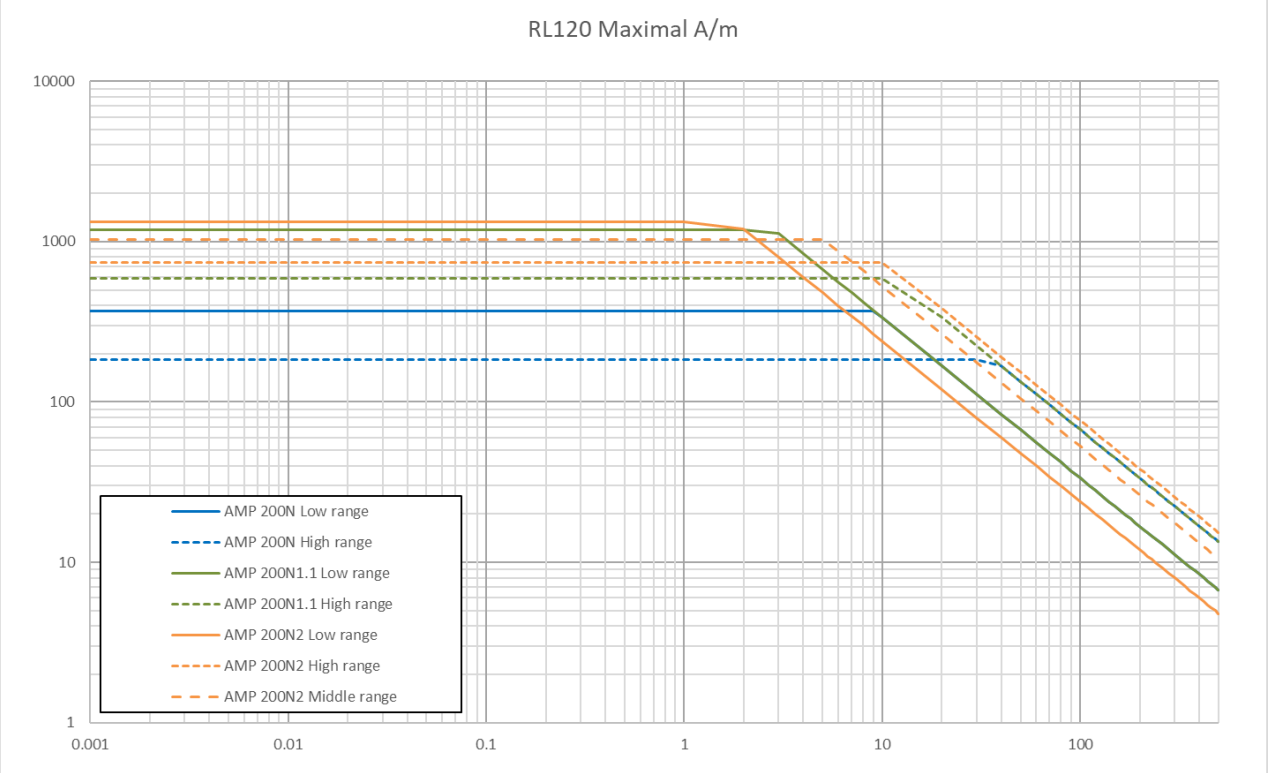
C: Measuring Equipment:

The current sensor is a current transformer or a shunt resistor probe connected to a measurement receiver. This instrument will measure the transferred ac voltage. The selected AC current instrument must be able to measure up to 100kHz.

Measurement Equipment	Transform the current into a rms ac voltage
Current Probe	
Current Shunt	

12.4.2 General Information about Magnetic Immunity

Below is an overview of the field strength limits using various AMP 200N models.



Generally speaking the larger the coil, the more current and/or windings you need to get the desired field strength inside the coil. The more windings, the higher the resistance and therefore the more voltage you need to get a certain current into the coil to achieve the desired field strength.

Even though a coil advertises a certain field strength on its datasheet, the amplifier must be capable of the necessary current and voltage to get that field strength. So you can see that it's not just the coil, but the type amplifier that's used that determines the field strength

$$\text{A/m max.} = \min\begin{cases} Arms\ max. \times Coil\ Factor & (Current\ limitation\ for\ low\ frequency) \\ \frac{Vp\ max}{\sqrt{2}} \times \frac{Coil\ Factor}{Coil\ imp. \times 2\pi f} & (Voltage\ limitation\ for\ high\ frequency) \end{cases}$$

For this reason, we recommend the RL 120 for most applications.

Note: Fully compliant ISO 11452-8 Level 4 is not achievable with any known Helmholtz coils.

12.4.3 Setup for Coupled Immunity: RI 150

These requirements are related to component immunity from wire-to-wire coupling of unintended continuous disturbances. These disturbances originate from high current PWM sources and the vehicle’s charging and ignition system.

Default test setup

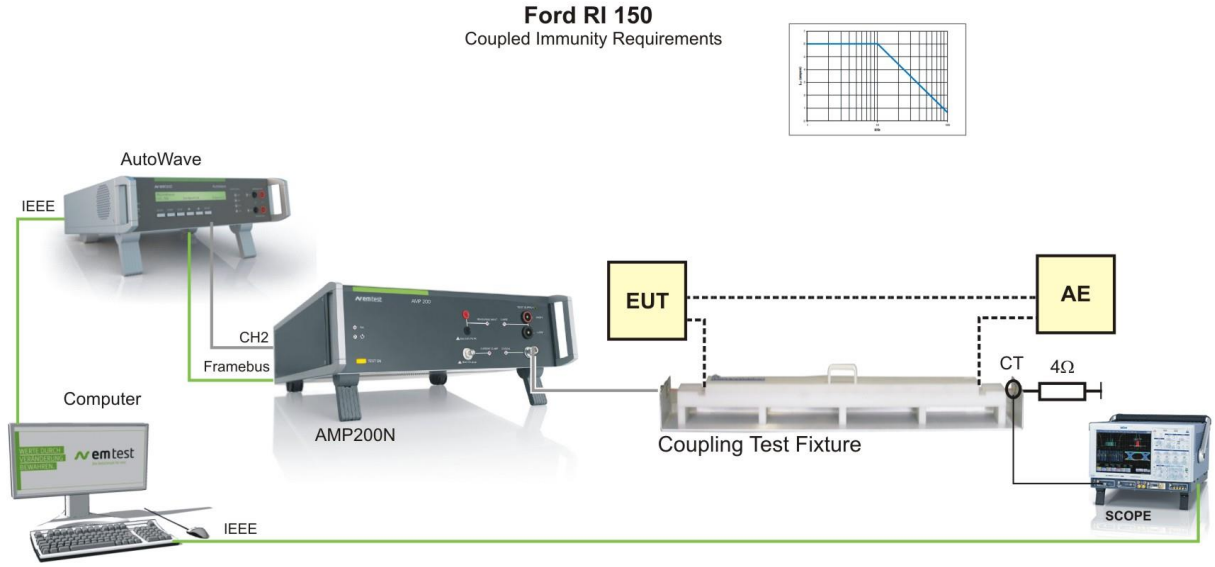


Figure 17 Setup for RI 150

RI 150 Test Parameter requirements

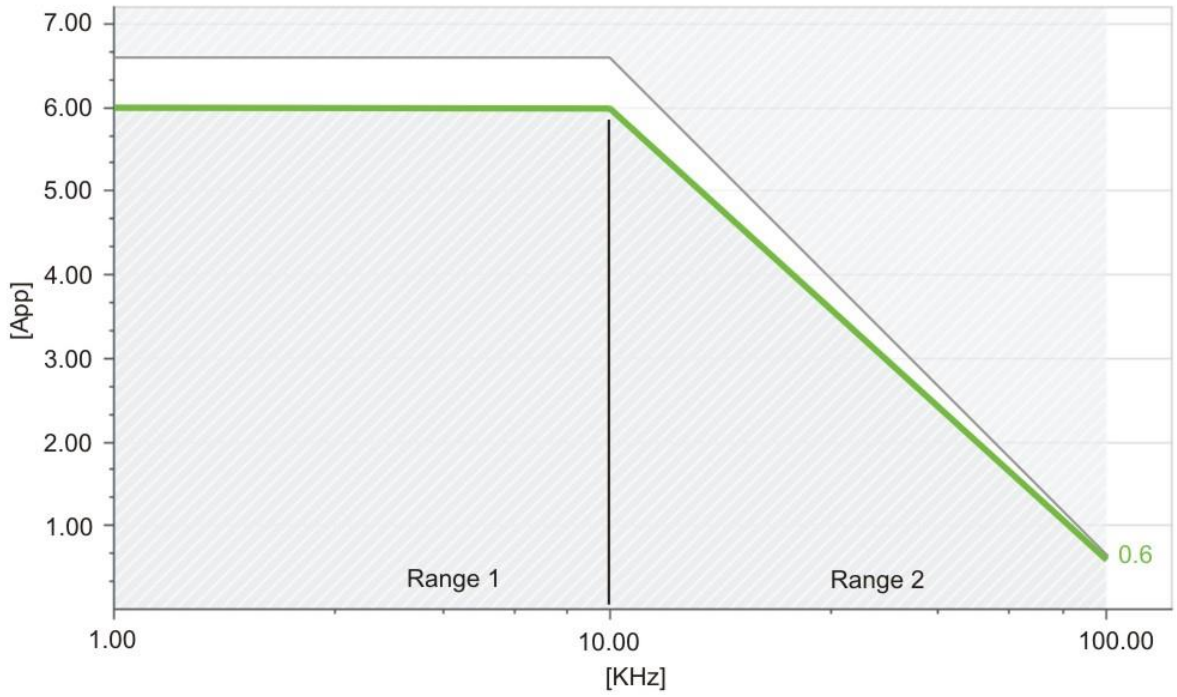


Figure 18 Graph for RI 150

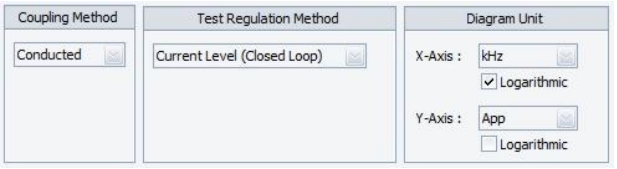
Range	**Frequency** [kHz]	**Level** [I p-p]	**Frequency step** [kHz]
Range 1	1 – 10	6	0.5
Range 2	10 - 100	6 – 5.4 log (f/10)	5

Test characteristics for RI 150

Default settings as per Standard

Method:

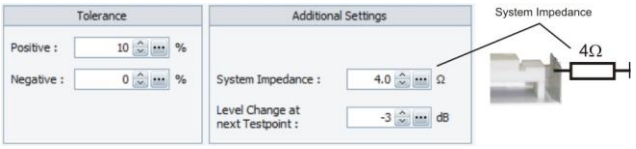
Coupling Method : Conducted
Test Regulation Method: Current Level (Closed Loop)
Diagram Unit X-Axis : kHz ; log
Y-Axis: A pk-pk ; linear



Tolerances

Tolerances : +10% -0%

Additional Settings:
System Impedance 4.0Ω or used value
Level Change at next Testpoint: -3dB



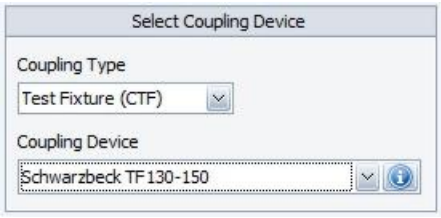
User Software settings

The user has to complete the test settings with his individual used coupling and measuring devices.
New coupling devices can be installed in the menu **Setup/Coupling Device** by the user.

A: Coupling

Coupling Type Test Fixture

Coupling Device Schwarzbeck TF130-150
R&S RSA TS-RI130



B: Current Measuring Instrument:

The current measuring is realized with a current probe connected to a measurement receiver. The AC current instrument will measure the transferred ac voltage and must be able to measure up to 100kHz

Measurement Instrument	Measuring AC voltage
Scope	Mandatory in Ford EMC-CS 2009 standard
Instrument value	Voltage Peak to Peak

C: Measuring Equipment (current sensor)**:**

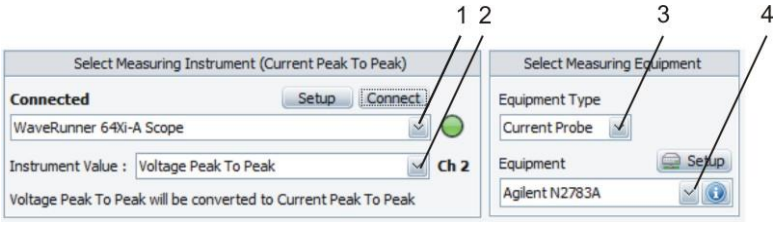
The current sensor is a current transformer probe connected to a measurement receiver. This instrument will measure the transferred ac voltage. The selected AC current instrument must be able to measure up to 100kHz

Equipment Type	Transform the current into a rms ac voltage
Current Probe	
Equipment	
Agilent N2783A	Ratio 0.1V/A

Current Measuring on Channel 2:

Measuring Instrument (AC current)
1. Instrument Scope model
2. Instrument value Voltage pk-pk

Measuring Equipment
3. Equipment Type Current Probe
4. Equipment Agilent N2783A



For scope parameter settings please refer to the Autowave software manual.

12.4.4 Immunity from Continuous Power Line Disturbances: CI 210

The device shall be immune from continuous disturbances that occur on the vehicle's low voltage (i.e. 13.5 VDC) electrical distribution system.

Default test setup

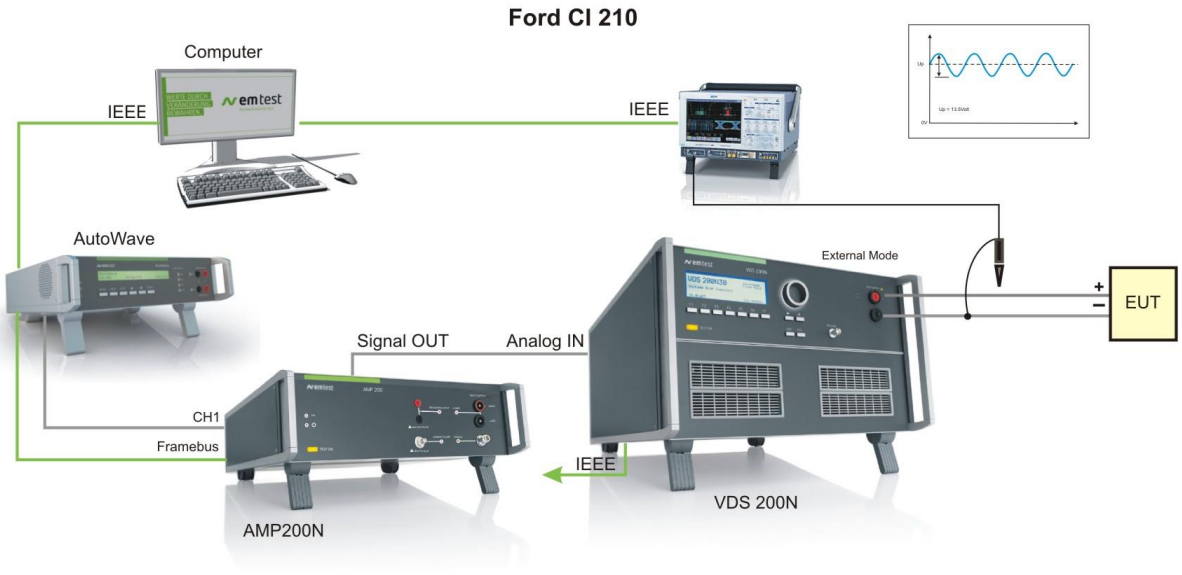


Figure 19 Setup for CI 210 closed loop with scope

RI 210 Test Parameter requirements

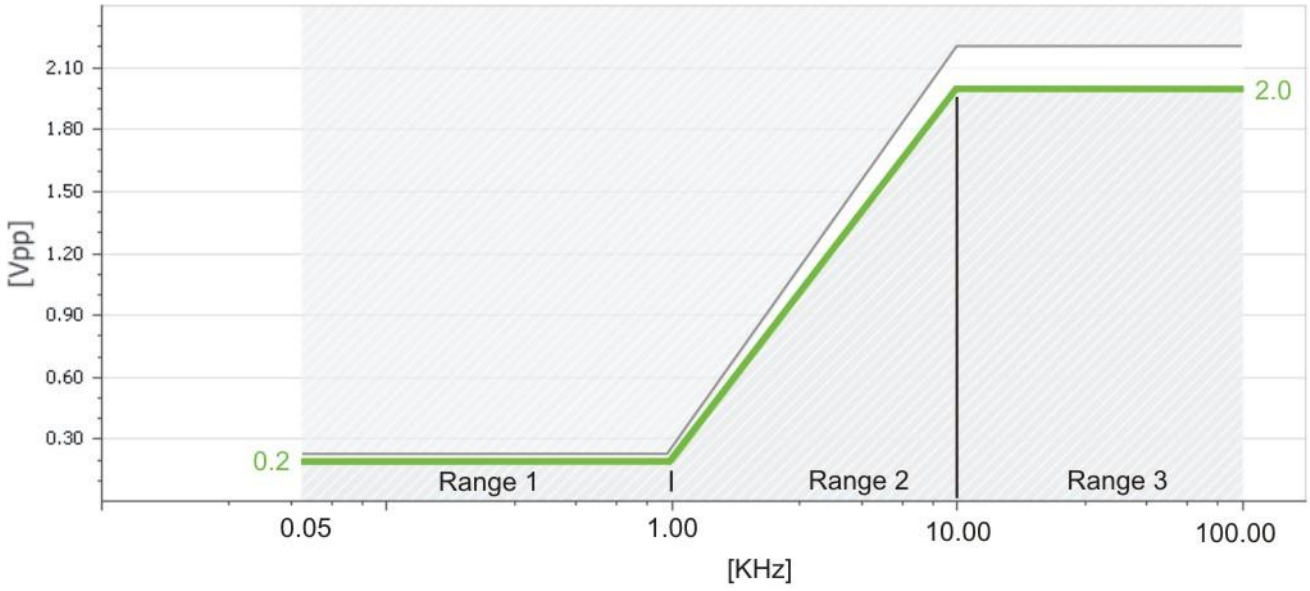


Figure 20 Graph for CI 210

Range	Frequency [kHz]	Us [Vp-p]	Frequency step [kHz]
Range 1	0.05 – 1	0.2	0.05
Range 2	1 – 10	0.2 x f	0.5
Range 3	10 - 100	2.0	5

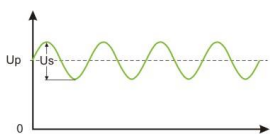


Fig. 8.11: Interference Signal

Test characteristics for CI 210

Method:

Coupling Method : Conducted

Test Regulation Method: Voltage Level (Closed Loop)

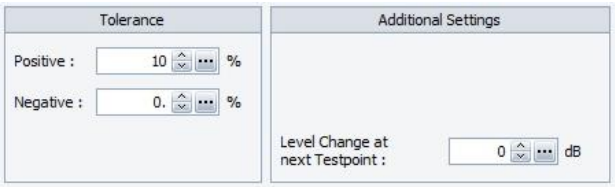
Disturbance Current limit : yes/no setted value

Diagram Unit X-Axis : kHz ; Log
Y-Axis: Vpp ; linear

Example Closed Loop

Tolerances

Tolerances : positive +10%
negative -0%

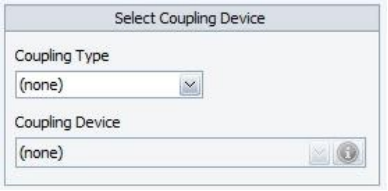


Additional Settings (Closed Loop with Scope only)
Level Change at next Testpoint: 0dB

Couplings

Coupling Type none (direct)

Coupling Device none



User Software settings (Closed Loop with Scope only)

The user has to complete the test settings with his individual used measuring devices.
New measuring instruments can be installed through the Setup Menu in Mainwindow of Auoewave.control or by clicking the **setup** button in the Voltage Measuring panel by the user.

A: Voltage Measuring Instrument: CH1

Measurement Instrument Measuring AC voltage (pk-pk)
Scope Mandatory in Ford EMC-CS 2009 standard

Instrument Value Voltage Peak To Peak

B: Measuring Equipment (voltage probe)**:**

Equipment Type: Voltage Probe

Equipment: LeCroy HFP 2500 10:1

Remark

The 200mV pk-pk voltage ripple signal at the test start needs a signal of only 33mVpk-pk in the signal generator (range ± 10V). Additional the VDS200 noise is specified as < 0.2V pk-pk. Therefore low signals will have a noise ripple who loock very high.

12.4.5 Immunity to Ground Voltage Offset: CI 250

Components shall be immune from AC ground offset voltages. Requirements include both continuous and transient disturbances.

Default test setup Continuous Disturbances

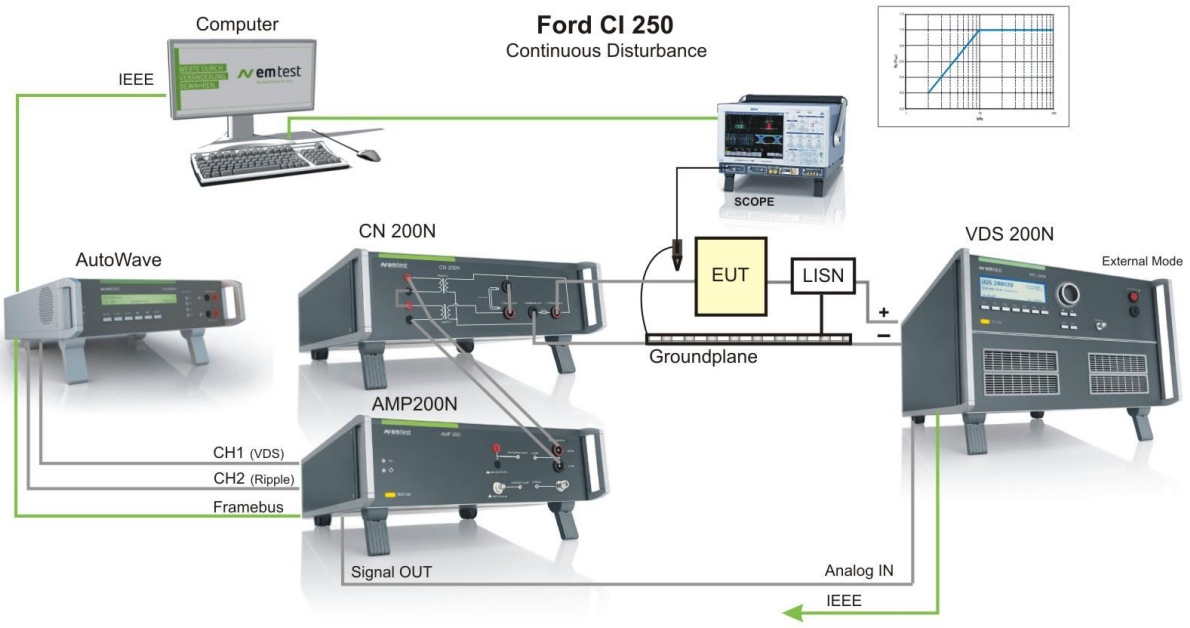


Figure 21 Setup for CI 250

RI 250 Test Parameter requirements

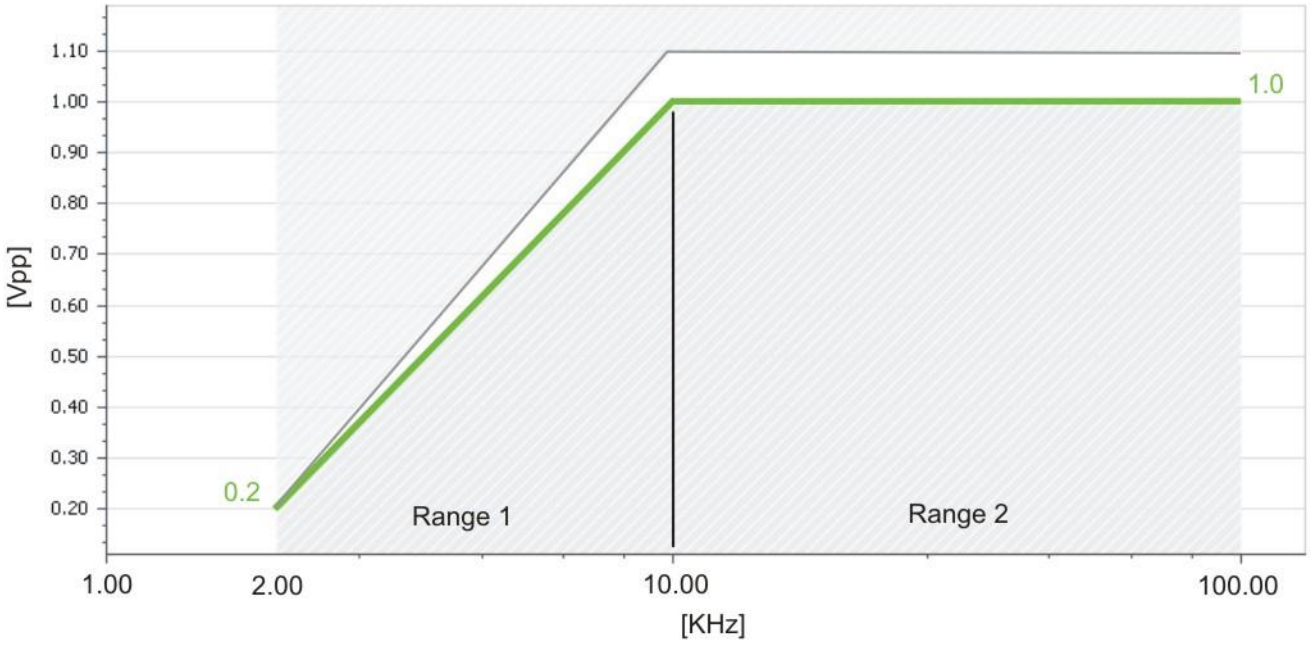
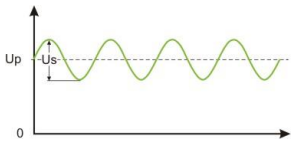


Figure 22 Graph for CI 210

Range	Frequency [kHz]	Us [Vp-p]	Frequency step [kHz]
Range 1	2.0 – 10	1.0+1.14 log(f/10)	0.5
Range 2	10 - 100	1.0	5

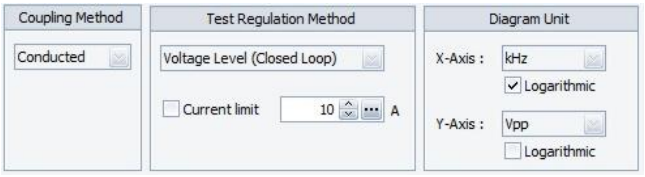


Test characteristics for CI 250 continuous interference
Method:

Coupling Method : Conducted

Test Regulation Method: Voltage Level (Closed Loop)
Disturbance Current limit : yes/no setted value

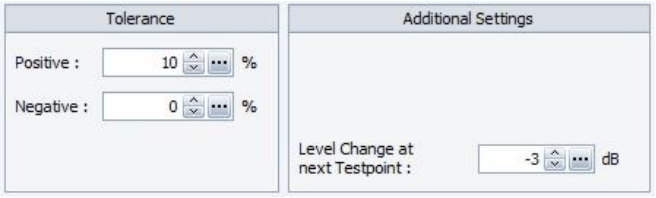
Diagram Unit X-Axis : kHz ; Log
Y-Axis: Vpp ; linear



Tolerances

Tolerances : positive +10%
negative -0%

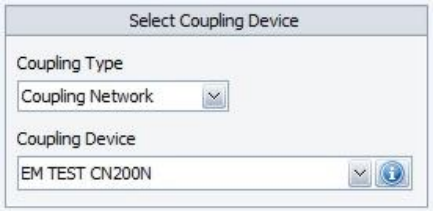
Additional Settings (Closed Loop with Scope only)
Level Change at next Testpoint: -3dB



Couplings

Coupling Type Coupling Network

Coupling Device EM TEST CN 200N



User Software settings

The user has to complete the test settings with his individual used coupling and measuring devices.
New coupling devices can be installed in the menu **Setup/Coupling Device** by the user.

A: Voltage Measuring Instrument:

Measurement Instrument Measuring AC voltage (pk-pk)
Scope Mandatory in Ford EMC-CS 2009 standard
Instrument Value Voltage Peak To Peak

B: Measuring Equipment (voltage probe)**:**

Equipment Type
Voltage Probe
Equipment
LeCroy HFP 2500 10:1

Default test setup Transient Disturbances

Transient disturbances consist of a damped sinusoidal pulse with a resonant frequency of 100 kHz illustrated in Figure 8.16. The pulse is applied using the delay sequence illustrated in Figure 8.17.
Delay times for the four sequences are listed in Table 18-2. Of Ford EMC-CS 2009.2 Standard.

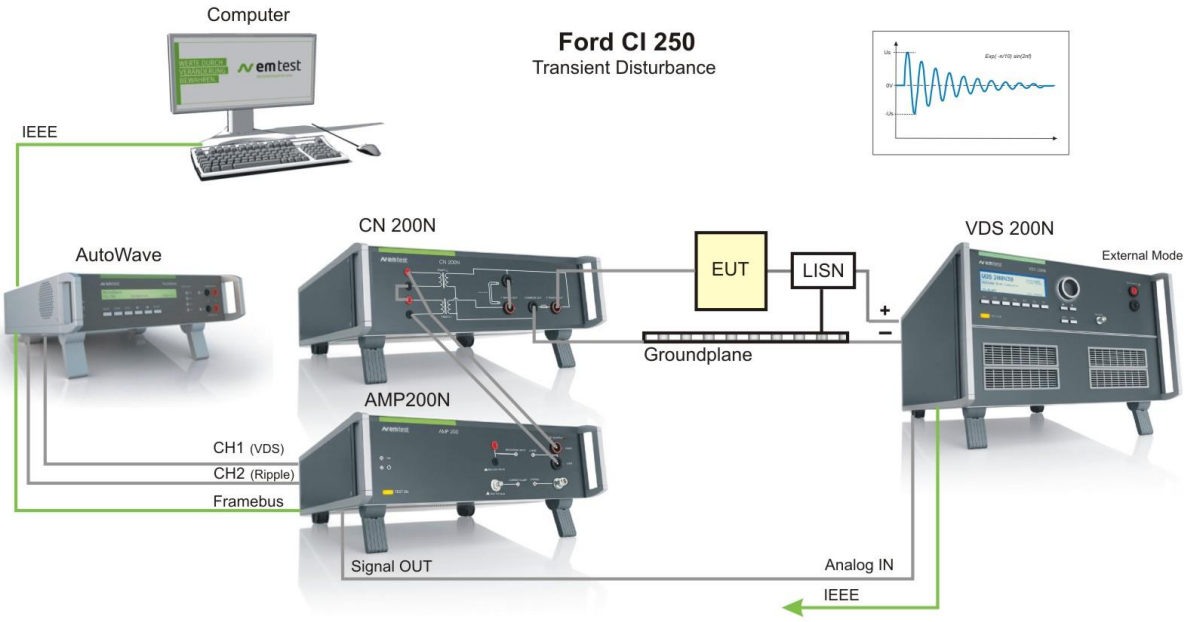


Figure 23 Setup for CI 250

CI 250 Test Parameter requirements

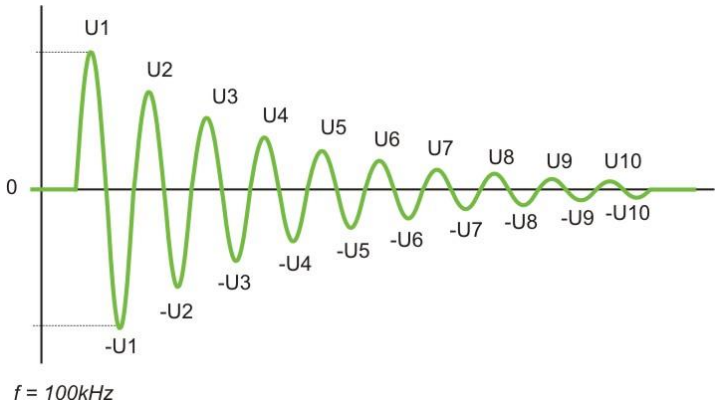


Figure 24 Damped sinusoidal pulse

Note : The Ford CS 2009.2 revision draft defines: The transient disturbances consist of a symmetrical damped sinusoidal pulse with a resonant frequency of 100 kHz.

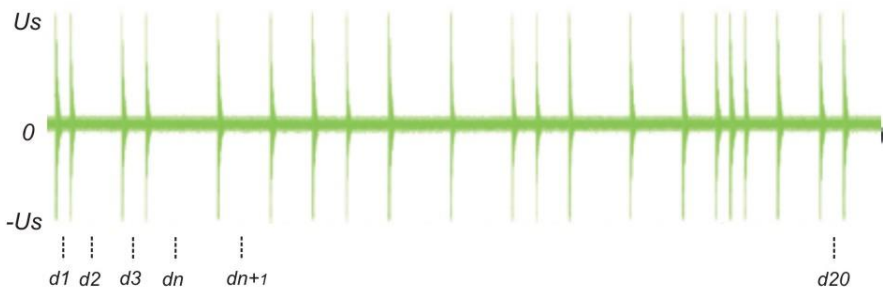
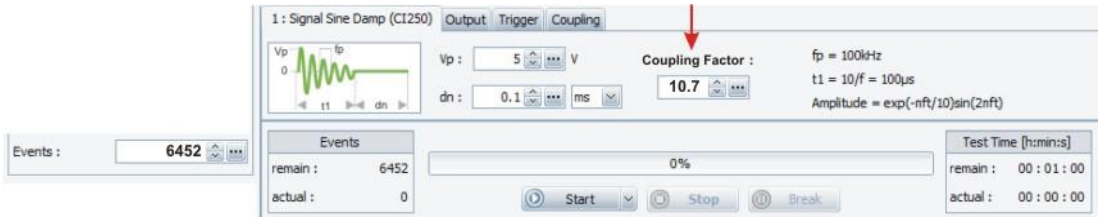


Figure 25 Damped sinusoidal with delay sequence d1…d20

Test characteristics for CI 250 Transient interference

Signal

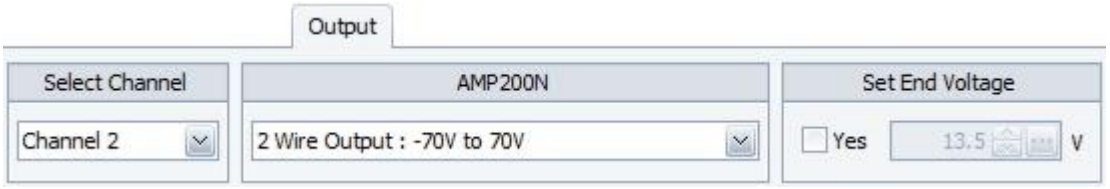
Adjust the coupling factor



The used Solar transformer 6220-1A has a 2:1 turns ratio transformation at 1kHz. This ratio will change with higher frequencies. At 100kHz the effective ratio is more like 16:1. EM Test thinks the inter-winding capacitance results in a higher than anticipated drive voltage to produce the +/-5V signal at the secondary.
Therefore the user has to adjust the transformer ratio of his transformer in the CN200N by changing the **Coupling Factor** to approx. 10.7 in the setup shown in the upper figure. The exact value must be measured during calibration.

Output

Settings as per user definition



Select Channel	Channel 2 (DDS for AMP200N)
AMP 200N	2 Wire output (High , Low)
Set End Voltage	As per user definition

Trigger

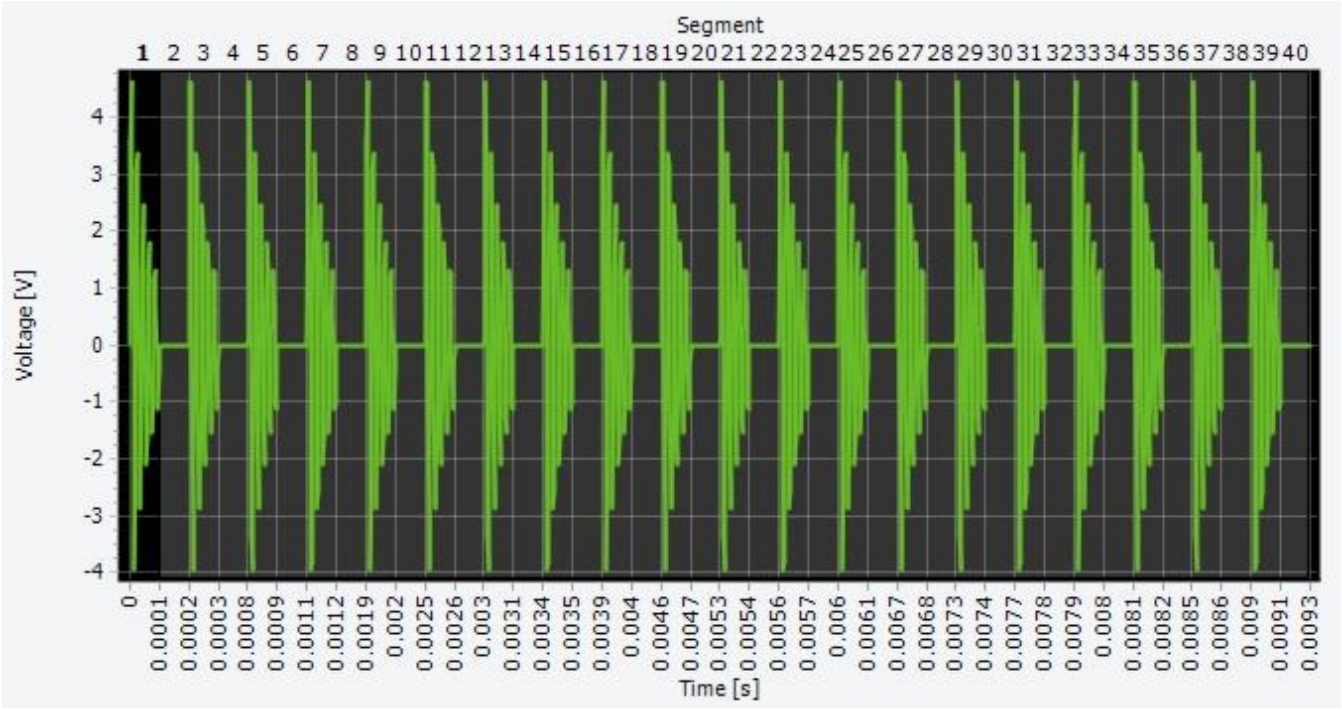
Settings as per user definition

Coupling

CN 200N

User Software settings

The user has to complete the test settings with his individual used coupling and measuring devices.
New coupling devices can be installed in the menu **Setup/Coupling Device** by the user.



A: Voltage Measuring Instrument:

The software needs no measuring instrument for control. The User has to measure himself the output voltage and to calculate the Coupling Factor for correct voltage setting.


ATTENTION

Attention: According to a Ford statement this test will be replaced by a 100kHz sinus burst with 100us duration in the next Ford EMC-CS 2009.2 release. This release is planned to be published in the begin of 2010.

12.5 Immunity to SAE J1113-2

Default test setup continuous interference

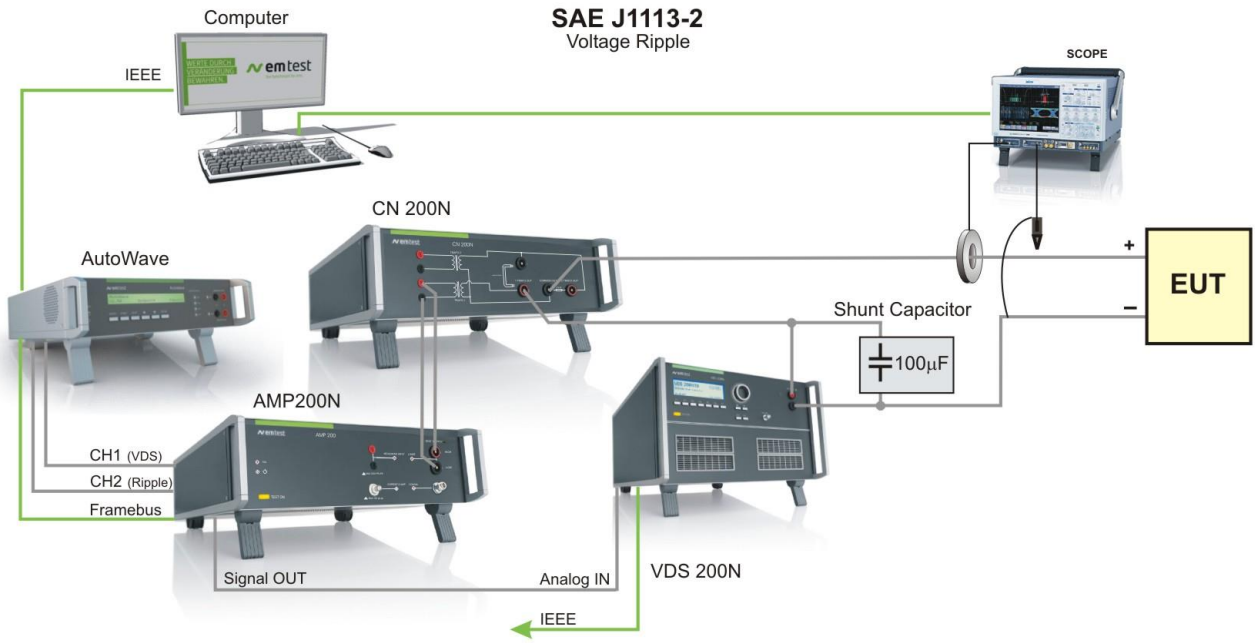


Figure 26 Setup for SAE J1113-2

SAE J1113-2 Test Parameter requirements

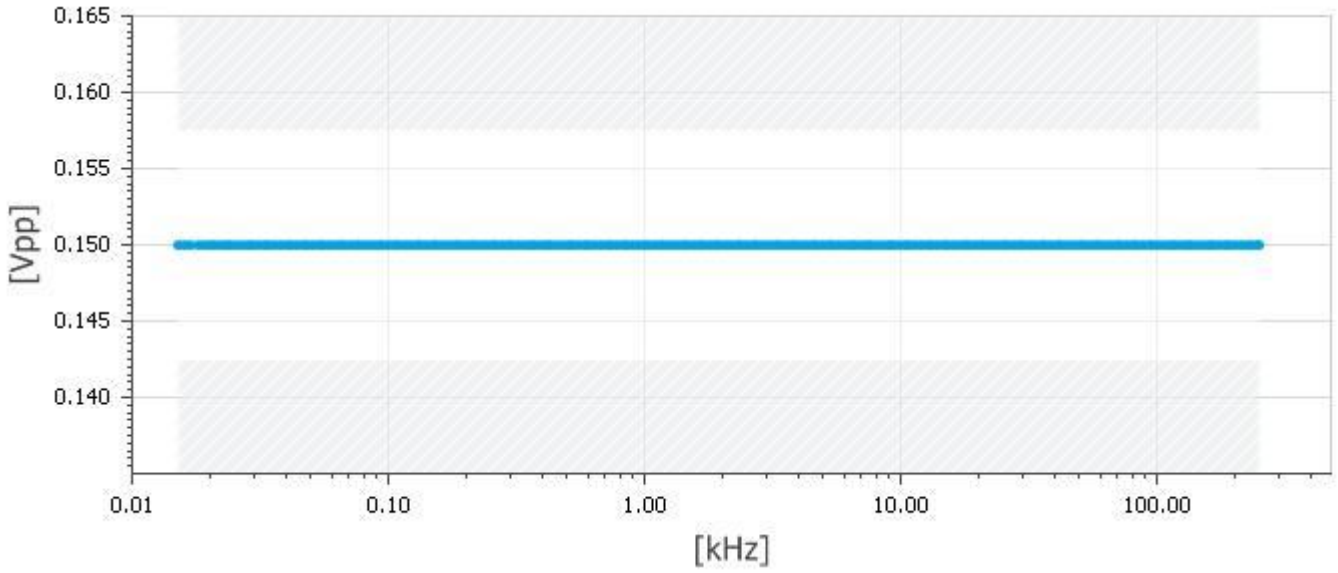
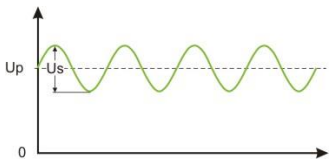


Figure 27 Graph for SAE J1113-2

Range	Frequency [kHz]	Us [Vp-p]	Frequency step
Range 1	0.015 – 250	0.15	5 %

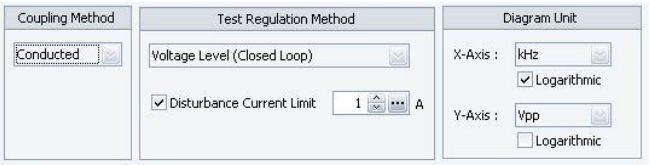


Test characteristics for SAE J1113-2 continuous interference
Method:

Coupling Method : Conducted

Test Regulation Method: Voltage Level (Closed Loop)
Disturbance Current limit : 1 A

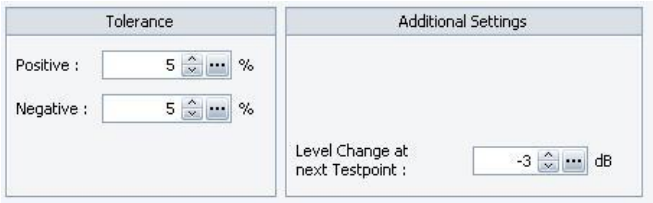
Diagram Unit X-Axis : kHz ; Log
Y-Axis: Vpp ; linear



Tolerances

Tolerances : positive +5%
negative -5%

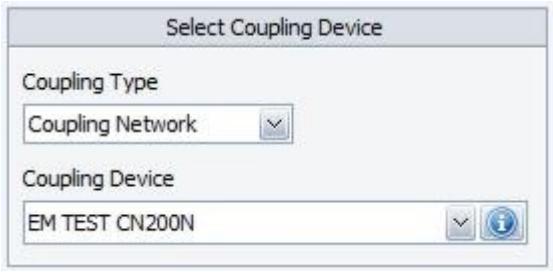
Additional Settings (Closed Loop with Scope only)
Level Change at next Testpoint: -3dB



Couplings

Coupling Type Coupling Network

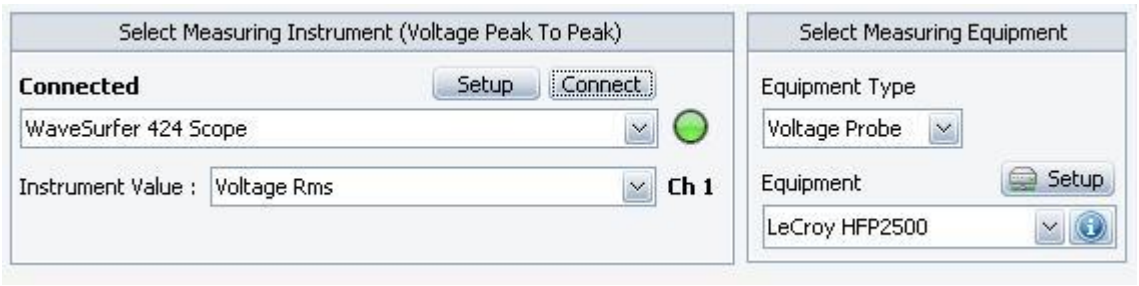
Coupling Device EM TEST CN 200N



User Software settings

The user has to complete the test settings with his individual used coupling and measuring devices.
New coupling devices can be installed in the menu **Setup/Coupling Device** by the user.

A: Voltage Measuring Instrument:



Measurement Instrument	Measuring AC voltage (pk-pk)
Scope	Mandatory in SAE standard
Instrument Value	Voltage **RMS value**
	* Peak to Peak is critical for measuring with a scope

B: Measuring Equipment (voltage probe)**:**

A current transformer probe is used as current sensor connected to a measurement scope. This instrument will measure the transferred ac voltage. The selected AC current instrument must be able to measure up to 250kHz

	Voltage measurement		**Current measurement**	
Equipment Type	Voltage Probe		Current probe	
Equipment	LeCroy HFP 2500	10:1	Agilent N278A3	100mV/A

12.6 Immunity to GLoyd GL VI-7-2 – 20 (DC)

11.6.1. DC power supply

For loading this testfile the user has to open the file "**GL VI-7-2 – 20 (DC).wim**".

1. Press in the main Window "Immunity play" 

.

2. Load the file "**GL VI-7-2 – 20 (DC).wim**". The program will open the test

Default test setup continuous interference

The software will show the picture of SAE J1113-2 with a very similar test setup.

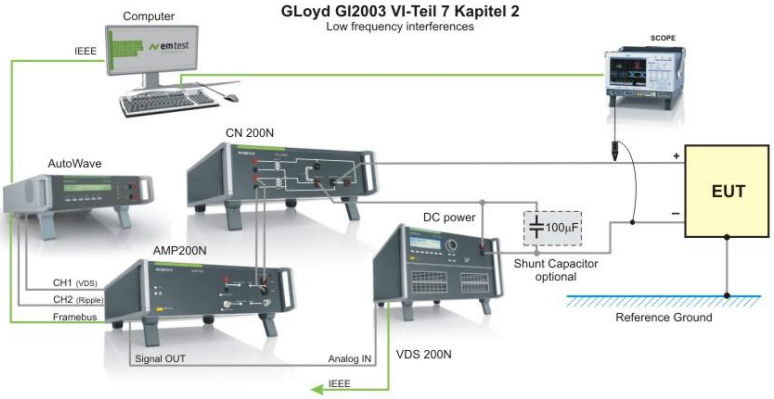


Figure 28 Setup for GL VI-7-2 – 20

Remark : The optional **Shunt Capacitor** is not part of the GLoyd test setup. In accordance with other standards with similar test as in SAE J1113-2, MIL STD 461 CS 101 or RTCA DO-160D Section 18, it may be necessary to use a shunt capacitor. The shunt capacitor is for shunt the dc source terminals for the RF signal, if difficulty is encountered in obtaining sufficient test voltage.

GLoyd GL 2003 VI-Teil 7 Kapitel 2 Test Parameter requirements

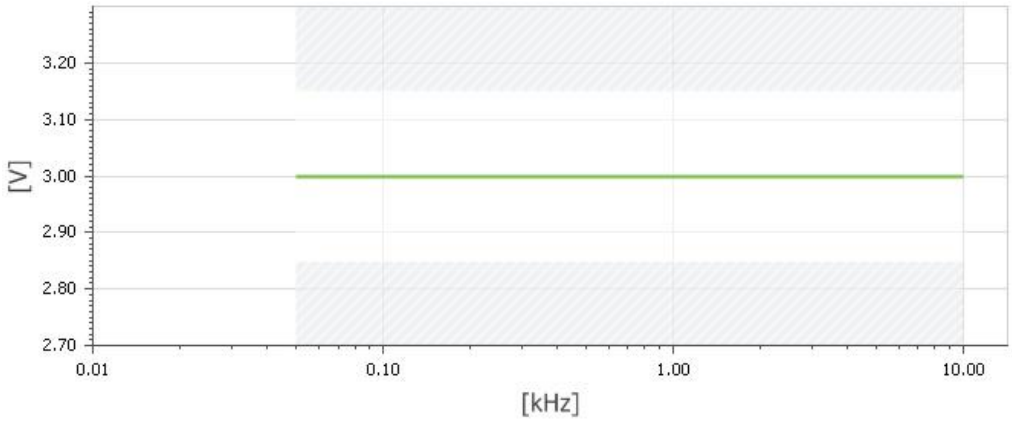
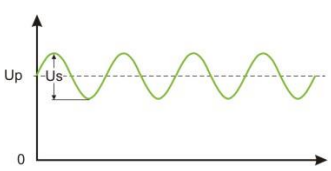


Figure 29 Signal voltage level for DC supply

Parameters for DC supply

Range	Frequency [kHz]	Us [Veff]	Frequency step
Range	0.05 – 10	3	1.5x10-3 dec/s (1% / 3s)



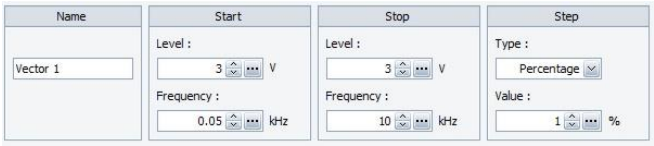
Test characteristics for GL VI-7-2-20 (DC) continuous interference

Vector 1:

Name : Vector 1

Start: Level: 3V Frequency 0.05Hz
Stop : Level: 3V Frequency 10.kHz

Step Type: Percentage
Value: 1%

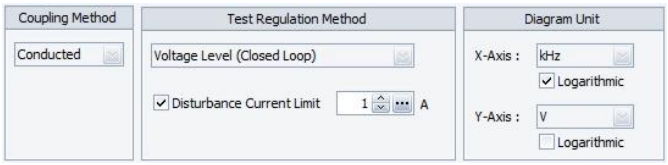


Method:

Coupling Method : Conducted

Test Regulation Method: Voltage Level (Closed Loop)
Disturbance Current limit : 1 A or setted value

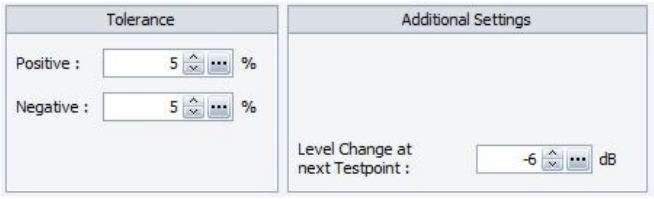
Diagram Unit X-Axis : kHz ; Log
Y-Axis: V; linear



Tolerances

Tolerances : positive +5%
negative -5%

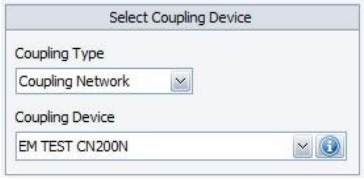
Additional Settings (Closed Loop with Scope only)
Level Change at next Testpoint: -6dB



Couplings

Coupling Type Coupling Network

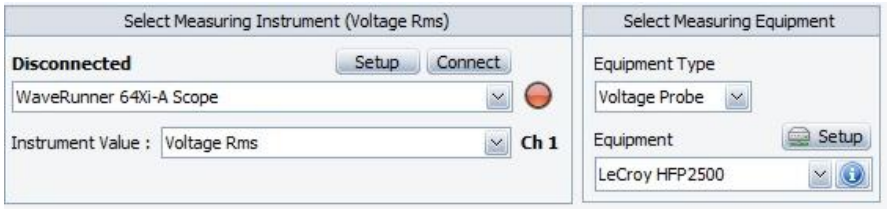
Coupling Device EM TEST CN 200N



User Software settings

The user has to complete the test settings with his individual used coupling and measuring devices.
New coupling devices can be installed in the menu **Setup/Coupling Device** by the user.

A: Voltage Measuring Instrument:



Measurement Instrument Measuring AC voltage (rms)
Scope Mandatory in GL standard
Instrument Value Voltage **RMS value**

B: Measuring Equipment (voltage probe)**:**

Equipment Type Voltage Probe
Equipment LeCroy HFP 2500 10:1

12.7 Ripple immunity with voltage and current measurement

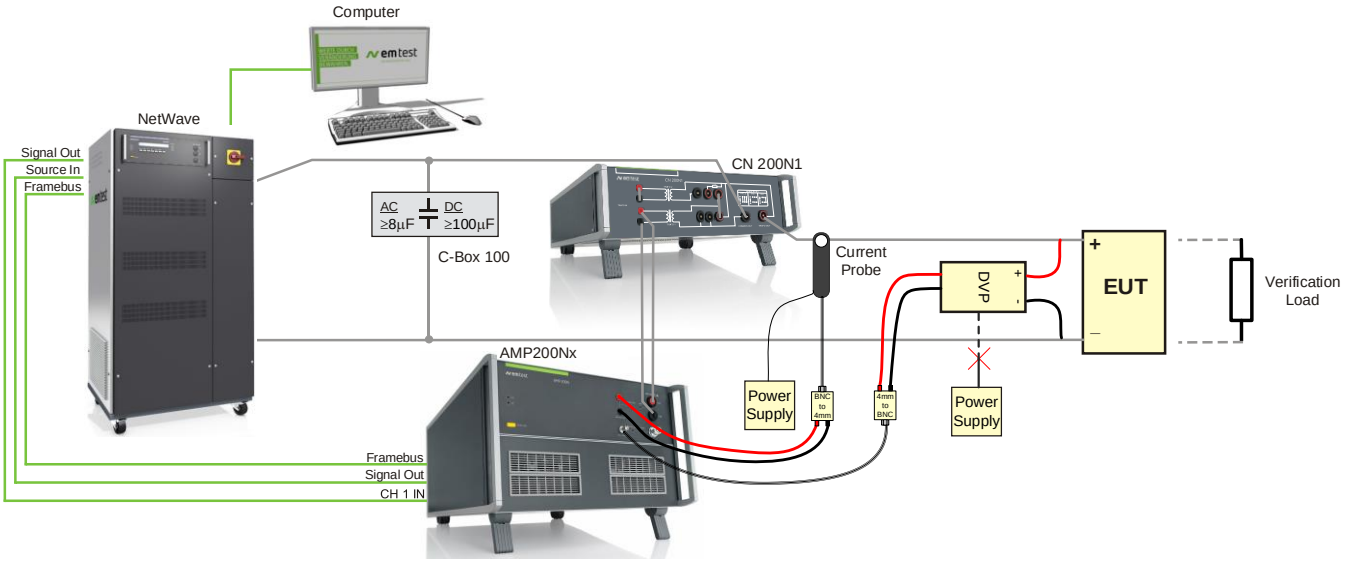


Figure 30 Setup for ripple immunity with swapped voltage and current measurement channels

The above figure shows the setup for a closed-loop ripple immunity testing. The AMP 200N measurement channels are used to measure the ripple current and voltage at the EUT terminals.

AMP 200N measuring input maximum allowed input voltages:

Voltage Measuring Input: max. 200 Vpp

Current Measuring Input: max. 10 Vpp

Recommended equipment:

Differential voltage probe	EM Test PVS 7 or Teseq MD 210
Active current probe	Keysight N2780B (2MHz, 500A), N2781B (10 MHz, 150A) or N2782B (50MHz, 30A) with external power supply
Shunt capacitor	EM Test C-Box 10/100-1000
Verification Resistor	EM Test SVP CL 100 (100 Ohms)

Hints for the setup:

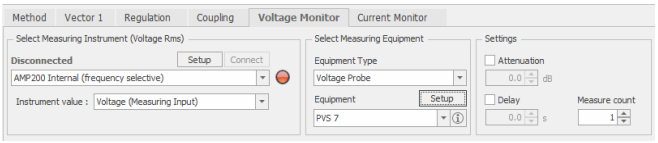
- Use active voltage and current probes (to match the impedance of the AMP measuring channels). Passive probes are not suitable.
- Power the differential voltage probe with batteries. Using an external power supply may generate interference that disturbs the ripple test.
- AMP measurement channels can be swaped in case higher voltage measurement resolution is required. In this case additional adapters from BNC to 4mm lab connectors (or vice versa).
- It is recommended to first verify the setup and performance using a verification load instead of the EUT.

Software setup

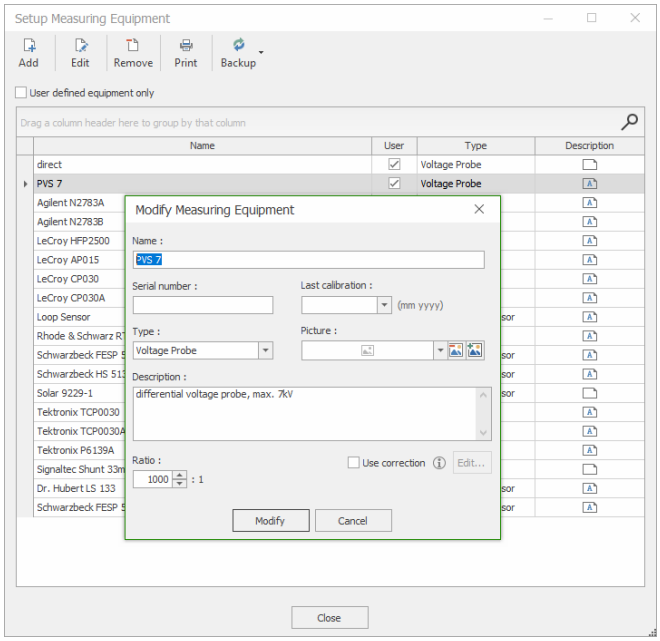
Setup with voltage and current inputs used in the normal way.

Voltage Monitor

In this case the internal AMP 200N voltage measuring input is used (4mm lab connector input).

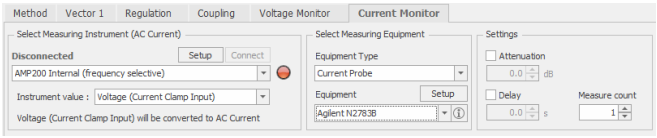


PVS 7 as differential voltage probe with 1000:1 ratio

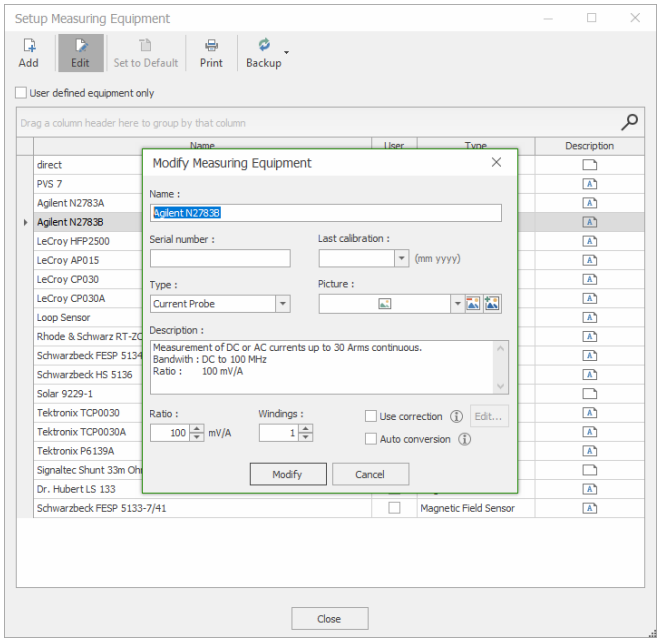


Current Monitor

In this case the internal AMP 200N current measuring input is used (BNC connector input).



Keysight N2783B as active current probe

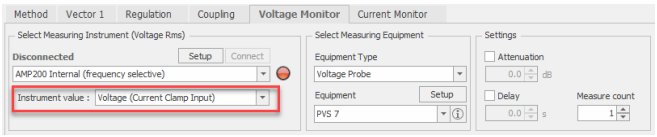


Inverted setup with swapped voltage and current inputs

This setup can be used to increase the sensitivity on the voltage measurement. The current input offers higher sensitivity (100 mV / A or 100 mV / V) compared to the voltage input.

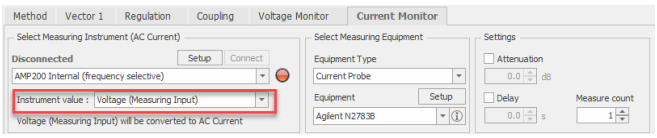
Voltage Monitor

In this case the internal AMP 200N voltage measuring input is used (4mm lab connector input).



Current Monitor

In this case the internal AMP 200N current measuring input is used (BNC connector input).



13 Waveform Verification

The Waveform verification is made at the AMP200N output plugs.

13.1 RI 140 H-Field verification

Verification test setup

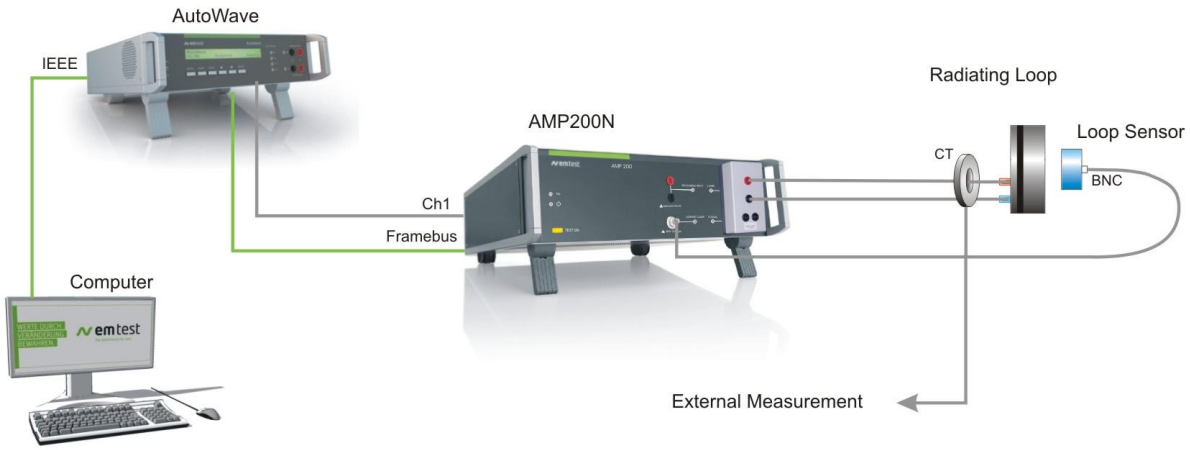


Figure 31 Setup for RI 140 short circuit disconnected at the MN HField box

RI 140 Verification Parameter requirements

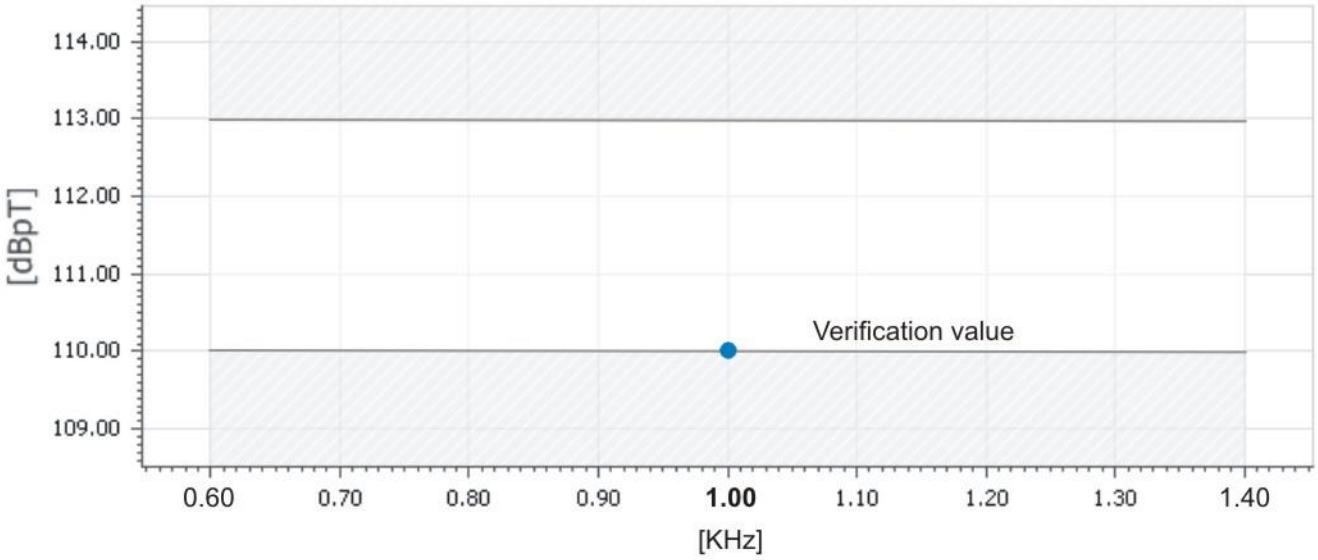


Figure 32 Graph for RI 140

Test characteristics Default settings as per Standard

Method:

Coupling Method : Radiated
Test Regulation Method: Verify H-Field
Diagram Unit X-Axis : kHz ; Log
Y-Axis: dBpT ; Log

Tolerances

Tolerances : +2.7% -0%

Additional Settings:
Start at Level : -20 dB
Level Change at next Testpoint: 0dB

If the first measurement is already too high the user can reduce the start Level (example to -30dB)

User Software settings for adapt the hardware

The user has to complete the test settings with his individual used coupling and measuring devices. New coupling devices can be installed in the menu **Setup/Coupling Device** by the user.

Coupling

Coupling Type Antenna

Coupling Device Radiating Loop

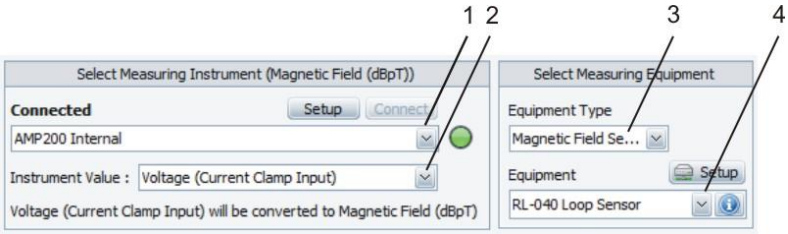
Select the antenna you are using for the test.

Setup for add or modify new Antennas in the Library in the Setup Coupling Devices
⇨ For more information refer to the Autowave software manual.

Magnetic Field Monitor:

Measuring Instrument (AC current)
1. Instrument AMP Internal
2. Instrument value Voltage

Measuring Equipment
3. Equipment Type H-Field sensor
4. Equipment Sensor name



B: Measuring Instrument (Magnetic Field [dBpT]) **:**

The current measuring is realized with a current probe connected to a measurement receiver. This instrument will measure the transferred ac voltage. The selected AC current instrument must be able to measure up to 100kHz

Measurement Instrument	Measuring AC voltage
AMP200 Internal Internal	EM Test proposal for loop sensor (Frequence selective instrument)
Scope	LeCroy preferred manufacturer by EM Test
Keitley 2000	

Connect Instrument
Press **Connect** for check the instrument connection.

Setup : for add or modify an instrument in the library

C: Current Monitor (Antenna current and therefore calculated-Field [dBpT])**:**

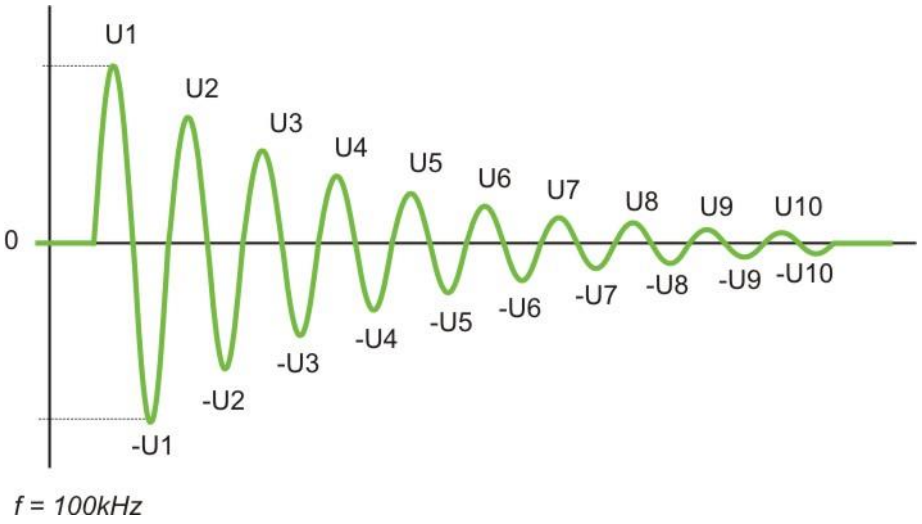
The current monitor is the antenna current measurement with a current probe connected to a measurement receiver. This instrument will measure the transferred ac voltage. The selected AC current instrument must be able to measure up to 100kHz.

Note: The most h-Field verification are performed at very low field levels 110 dBpT = 0.25A/m . Using a radiating loop with an antenna factor of 76.3, the resulting antenna current is in the range 2..3mA. To measure such small signal it is necessary to use a multimeter or receiverwith a resolution of these levels. A scope may not be sufficient.

Measurement Instrument	Measuring AC voltage
Keithley 2000 DMM	Voltage measurement (for calculation of the setted level [dBpT])
Measurement Equipment	Current measurement
Current Probe	Agilent N2783A

13.2 CI 250 Pulse verification

CI 250 Test Parameter requirements



Peak measurement

Un	Upeak
U1	5.00
U2	3.65
U3	2.67
U4	1.95
U5	1.42
U6	1.04
U7	0.76
U8	0.55
U9	0.41
U10	0.30

Tolerances:
Time interval ± 10%
Voltage +10% -0%

Climatic Test conditions
Temperature 23± 5.0 degrees C
Humidity 20 to 80% relative humidity (RH)

14 Appendix

14.1 Declaration of CE-Conformity

Manufacturer:	**AMETEK CTS GmbH**
Address:	Sternenhofstr. 15 CH 4153 Reinach BL1 Switzerland

declares, that under is 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:	AMP 200N	Low frequency signal source DC to 250kHz
	AMP 200N1.1	Low frequency signal source DC to 250kHz
	AMP 200N2	Low frequency signal source DC to 500kHz

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:

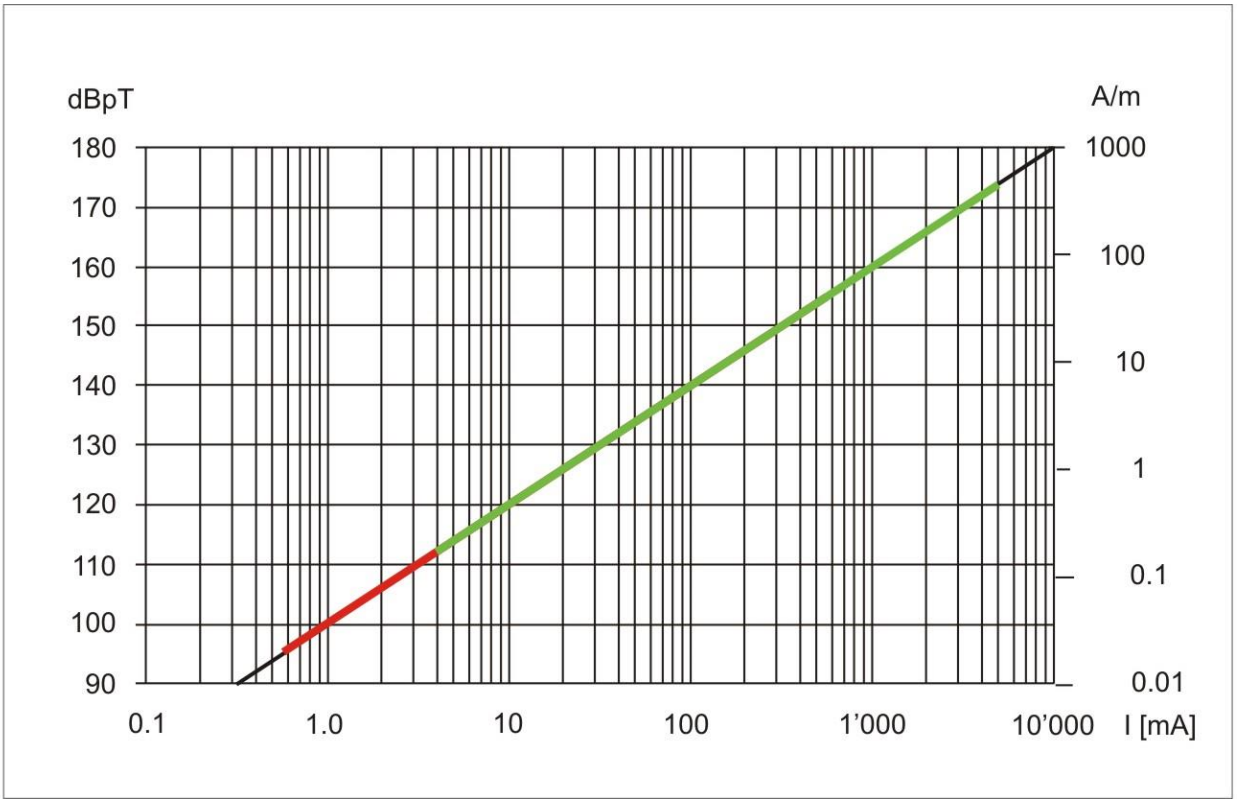
EN 61326-1:2013	Electrical equipment for measurement, control and laboratory use (Requirements for devices to use in industrial area.)
EN 61000-3-2:2014	Limits for harmonic current emissions
EN 61000-3-3:2013	Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems.

The purpose of this instrument is the generation of defined interferences signals for EMI immunity testing. Depending on the arrangement of the test rig, the configuration, the cabling and the properties of the EUT itself, a significant amount of electromagnetic radiation may result that could also affect other equipment and systems. The user himself or herself is ultimately responsible for the correct and controlled operation of the rig. In case of doubt, the tests should be carried out in a Faraday cage.

Manufacturer
AMETEK CTS GmbH
Sternenhofstr. 15
CH 4153 Reinach
Tel: +41 61-7179191
Fax: +41 61-7179199

By	A. Burger Business Manager Conducted EMC
Place	Reinach BL, Switzerland
Date	1. July 2017

14.2 Radiating Loop H-Field versus antenna current



Green range : --- Normal operating
Red Range : --- Additional lower range with matching network