

QUICK-START GUIDE AND SAFETY INSTRUCTIONS

NSG 4070C

NSG 4070C-35
NSG 4070C-40
NSG 4070C-45
NSG 4070C-60
NSG 4070C-80
NSG 4070C-110
NSG 4070C-0



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AMETEK CTS GmbH
Sternenhofstrasse 15
4153 Reinach BL1
Switzerland

Phone: +41 61 204 41 11
Fax: +41 61 204 41 00

URL : www.ametek-cts.com

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1. Safety

Observe all precautions to assure your personal safety. Read the user manual carefully. Pay special attention to safety and operation details!

Pay special attention to safety and operation details!

1.1 Safety and warning symbols

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. 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. 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. Do not proceed until its conditions are fully understood and met.



This symbol indicates non-ionizing radiation. Non-ionizing radiation may pose a health hazard to operators. Protective measures such as switching off the RF before entering the Faraday cage, level limitation and / or spatial distance are common measures.



This symbol indicates access of persons with pacemakers prohibited.



This symbol indicates the ground terminal.



This symbol indicates the protective earth 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 injury or death. If a "WARNING" is indicated, do not proceed until its conditions are fully understood and met.

1.2 Safety Aspects

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

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



WARNING

Improper or careless handling can be fatal!

Use of the generator is restricted to authorized and trained specialists

1.3 Connection to the mains and PE

- ▶ The instrument conforms to protection class 1. Operation without a protective earth connection is forbidden!
- ▶ Before switching on the device, check whether the selected voltage matches the supply voltage. The position of the voltage selector must correspond with the mains. If you change the mains voltage, replace the fuses according to the recommended value.
- ▶ A proper protective earth connection through the connector of the power cord is essential for safe operation.
- ▶ High leakage currents can cause the residual current circuit breaker of the mains to trip. In this case, the use of an isolating transformer is required.
- ▶ Handle the power cord carefully. Hold the plug when unplugging the cord.
- ▶ Never use the product if the power cord or the plug is damaged.
- ▶ Use only power cords and connector specified for your product.
- ▶ Do not abuse the cord. Never use the cord for carrying, pulling or unplugging the unit. Keep cord away from heat, oil, sharp edges or moving parts.
- ▶ Prevent the device from being switched on or energized unintentionally. Make sure that the switch is in the off position before connecting the device to the mains.
- ▶ Disconnect the power plug if you are not going to use the device for a long period of time.

1.4 Connections to other ports with dangerous voltages (AE, EUT, RF port ...)

- ▶ Only use the connection cables and plugs specified for your product which enable safe working. They must comply with the required classification and have suitable voltage and current ratings for the application.
- ▶ Handle the connection cable carefully. Hold the plug when unplugging the cable.
- ▶ Never use the product if the connection cable or plug is damaged.
- ▶ Avoid touching conductive parts unless they have been de-energized by suitable means and secured against being switched on again for the period of handling. Industrial connectors often have insufficient protection against electric shock due to their application.

1.5 Connection to the ground plane or Faraday cage

- ▶ Remove the protective foil from under the device and adapter housing to ensure good electrical contact.
- ▶ Light equipment should be weighted down, clamped to the base plate or other measures should be taken to ensure good electrical contact over a wide surface area and on a permanent basis.



- ▶ Connect the device with the ground plane before using.
- ▶ The operation without a second, only with a tool removable earth leakage connection is prohibited.
- ▶ Check the ground connection at regular intervals.

- ▶ Ensure that a reliable return path for the interference current is provided between the equipment under test (EUT) and the generator. The reference ground plane and the earth connections to the instrument as described in the relevant test standard serve this purpose well.

1.6 Disconnection from the mains, PE, ground and control devices

- ▶ Always set the power switch to the "Off" position and wait few seconds before disconnecting the power cord.
- ▶ Disconnect the power cord and all connection cords when moving the unit.

1.7 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.

1.8 Risk of electric shock

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

- ▶ To reduce the risk of electric shock, do not remove parts from the housing.
- ▶ There are no user serviceable parts inside the unit. Certain parts inside the instrument work at mains voltage or at high frequency and are not provided with any protection against being touched.
- ▶ Only approved accessory items, connectors, adapters, etc. are to be used to ensure safe operation



WARNING

- ▶ The lines inside the device are not protected by a fuse. Therefore, the user must implement the protection of the device against short-circuits by means of suitable fuses.
- ▶ Avoid an overload by taking suitable precautions.
- ▶ In the event of a fault, dangerous and unexpected voltages may occur. Avoid touching conductive parts unless they have been de-energized by suitable means and secured against being switched on again for the period of handling.

1.9 Operating Environment

- ▶ Operate the equipment only in dry surroundings. Allow any condensation that occurs to evaporate before putting the instrument into operation. Do not exceed the permissible ambient temperature, humidity or altitude. Operate the unit not in explosive surroundings.
- ▶ No objects filled with liquids, such as coffee cups, shall be placed on the unit.
- ▶ Do not insert foreign objects in the ventilation holes.
- ▶ Do not obstruct the ventilation holes (also on the underside). Ventilation should not be impeded by covering the ventilation openings with items or other equipment.
- ▶ Avoid high temperatures. Allow for sufficient heat dispersion when installed in a rack. Do not place the product on radiators or fan heaters. The ambient temperature must not exceed the maximum specified temperature of this product.
- ▶ Keep the test area clean and well lit. Cluttered or dark areas invite accidents.

1.10 Test execution

- ▶ Check once again that all connections are proper including the ground and protective earth.
- ▶ Remove any adjusting key or wrench before switching on or energizing the device.
- ▶ The test area must be organized that no unauthorized persons have access during execution of a test.
- ▶ Operating the product requires special training and intense concentration. Make certain that persons who use the products are physically, mentally and emotionally fit enough to operate the products; otherwise injuries or material damage may occur.
- ▶ EUTs together with all accessories and cables are to be regarded as being live during the execution of a test.
- ▶ The safety instructions concerning all the instruments and associated equipment involved in the test setup are to be observed.
- ▶ The configuration of the test setup is to be strictly in compliance with the methods described in the relevant standard to ensure that the test is executed in a compliant manner.
- ▶ Working with high voltages alone is dangerous and prohibited by law.
- ▶ The high voltages must be switched off when nobody is present.

1.11 Dangers concerning the generator

- ▶ Local regulations for the protection of radio services must be observed. The interference generated by the generator can cause both conducted and radiated interference.
- ▶ If the radiated energy exceeds the permissible level, a shielded chamber with filtering of the supply lines or similar must be used. Decisive for the measures are the used levels, the geometry of the setup, the frequency range and the distance to the neighbor.
- ▶ Depending on the level used, the effectiveness of the connected antenna, TEM cell or similar, fields can be generated using appropriate power amplifiers, from which the operating personnel must be protected by suitable measures.
- ▶ Localized burning, arcing or ignition of explosive gases.
- ▶ Disruption of unrelated electronic, telecommunications or navigational installations or heart pacemakers through intentional and unintentional radiation of RF energy.



WARNING

Persons fitted with a heart pacemaker must not operate the instrument nor approach the test setup while it is in operation.

1.12 Dangers concerning the EUT

- ▶ EUTs are frequently simply functional samples that have not previously been subjected to any safety tests. Therefore, in some cases, the EUT is quickly damaged through internal overloads caused by the control electronics being disrupted. The EUT may even begin to burn.
- ▶ As soon as the EUT shows signs of damage the test should be stopped and the equipment under test should be switched off.
- ▶ Possible erroneous behavior by the EUT for example, a robotic device may misbehave, or a temperature regulator may fail.
- ▶ Even when power is off, capacitors may retain an electrical charge.

1.13 Applicable safety standards

- ▶ Development and manufacture of the instrument complies with ISO 9001.
- ▶ The equipment conforms with the essential requirements of the EMC Directive 2004 / 108 / EC and Low Voltage Directive (LVD) 2006 / 95 / EC based on the following specifications applied: DIN EN 61326-1:2006, table 2 and chapter 7 class B and DIN EN 61010-1:2001

1.14 Intended use



WARNING

The purpose of this instrument is the generation of defined interferences signals for EMI immunity testing. Depending on the test stand layout, configuration, wiring, and the characteristics of the EUT itself, a significant amount of electromagnetic radiation may be generated that can affect people as well as other equipment and systems.

The device is designed for operation in industrial as well as home environment. For the intended operation, electromagnetic fields are generated by the connection of coupling devices (antennas, clamps, CDN etc.) or by the injection on lines. The operator, persons in the vicinity and the environment must be protected by suitable measures, e.g. Faraday cage.

1.15 Warranty Terms

AMETEK CTS provides this written warranty covering the product stated above, and if the buyer discovers and notifies AMETEK CTS in writing of any defect in material or workmanship within the applicable warranty period stated above, then AMETEK CTS may, at its option: repair or replace the product; or issue a credit note for the defective product; or provide the buyer with replacement parts for the product.

The buyer will, at its expense, return the defective product or parts thereof to AMETEK CTS in accordance with the return procedure specified below. AMETEK CTS will, at its expense, deliver the repaired or replaced product or parts to the buyer. Any warranty of AMETEK CTS will not apply if the buyer is in default under the purchase order agreement or where the product or any part thereof:

- is damaged by misuse, accident, negligence or failure to maintain the same as specified or required by AMETEK CTS;
- is damaged by modifications, alterations or attachments thereto which are not authorized by AMETEK CTS;
- is installed or operated contrary to the instructions of AMETEK CTS;
- is opened, modified or disassembled in any way without AMETEK CTS's consent; or
- is used in combination with items, articles or materials not authorized by AMETEK CTS.

The buyer may not assert any claim that the products are not in conformity with any warranty until the buyer has made all payments to AMETEK CTS provided for in the purchase order agreement.

1.16 Prohibition of unauthorized conversions and modifications

The user is not entitled to the device to perform its own modifications and adaptations. Modifying parts on the generator by unauthorized persons will void the warranty of the device and the correct functioning cannot be guaranteed.

1.17 Specific accessories required for safety reason

Only use accessories approved by AMETEK CTS for these generators and intended as accessories for these devices. Measuring instruments for the measurement of instrument parameters shall be designed for the maximum voltage and current from the generator. Otherwise safety cannot be guaranteed.

1.18 Procedure in case of hazard

If a hazard could exist due to an unintended condition of the device, the following procedure is recommended:

Disconnect the device- and EUT power supplies from the power supply and ensure that the device is always earthed via the supply lines or a different ground connection. Wait at least 15 minutes and ground all outputs via a 10 k Ω , 15 W resistor. Call an AMETEK service center.

2 Unpacking, storage and transport

2.1 General

Save all packing materials! They will be needed in order to safely package the equipment for calibration service or repair.

Packaging materials

- Carton: Cardboard
- Padding: CFC-free polystyrene foam
- Plastic bags: Polyethylene





▶ Avoid the risk of condensation!

If a large temperature difference has occurred, allow time for the temperature to stabilize. This may take several hours.

2.2 Storage and transport

- ▶ Do not stack, either packaged or unpacked.
- ▶ Do not stand on end; arrows on the packaging must always point upwards.
- ▶ Protect from dampness, heat, cold and rain.
- ▶ Do not throw.
- ▶ Do not sit or stand on the instrument and packaging.

2.3 Unpacking

- Is the packaging damaged? If YES  transportation company
- Are all the packages present and correct? If NO  transportation company
- Open the packaging, remove the accessories.
- Grip the instrument at the sides and lift it from the packaging.
- Are the instrument or accessories damaged? If YES  transportation company
- Are the contents of the package complete? If NO  Teseq sales office
- Keep the instruction manual with the instrument.
- Keep the packaging.

2.4 Scope of delivery

- NSG 4070 mainframe
- Operating manual
- Spare fuses (2)
- RS232 cable (Nullmodem)
- Mains cable GB
- Mains cable CH
- Mains cable USA / JP
- Mains cable EU
- LAN cable, crossover, 3 m
- Keyboard (English)
- USO 4013 (USB to serial / optical converter with 20 m optical cable)

3 Description of the instrument

The NSG 4070 is a multi-functional device for carrying out EMC immunity tests to accompany development and conformity testing in accordance to IEC / EN 61000-4-6, IEC / EN 61000-4-3, IEC / EN 61000-4-20, IEC / EN 61000-4-21 and several BCI standards e.g. ISO 11452-4 or MIL-STD-461G CS114.

The NSG 4070 includes signal generator, power meters, several EUT monitoring interfaces and an optional Class A power amplifier module. The flexibility in the EMC lab is given by the wide frequency range of 4 kHz to 1 GHz, several models of internal power amplifiers, the possibility to connect external power amplifiers and directional couplers as well as the variety of interfaces for EUT monitoring.

The NSG 4070C includes extended parameters for the pulse modulation. Up to three pulse modulation settings can be defined in order to create an envelope. NSG 4070C meets the requirements of ISO / DTS 7637-4 Annex C: Test generator for pulsed sinusoidal disturbances, pulse A.

The powerful and easy to use firmware makes the NSG 4070 independent from an external PC and control software, however it can also be remote controlled for system operation. A state-of-the-art data transfer of test and measurement data for report generation is provided by USB stick to be plugged into the front panel.

In order to start with predefined parameter settings is recommended the optional test software icd.control. The software offers a large standard database and predefined drives for using external measuring devices. More complex systems including radiated tests can be controlled by using the software solution CIS (Compliance Immunity Software).

The NSG 4070 is supplied with remote interfaces LAN, electrical or optical RS232 and USB.

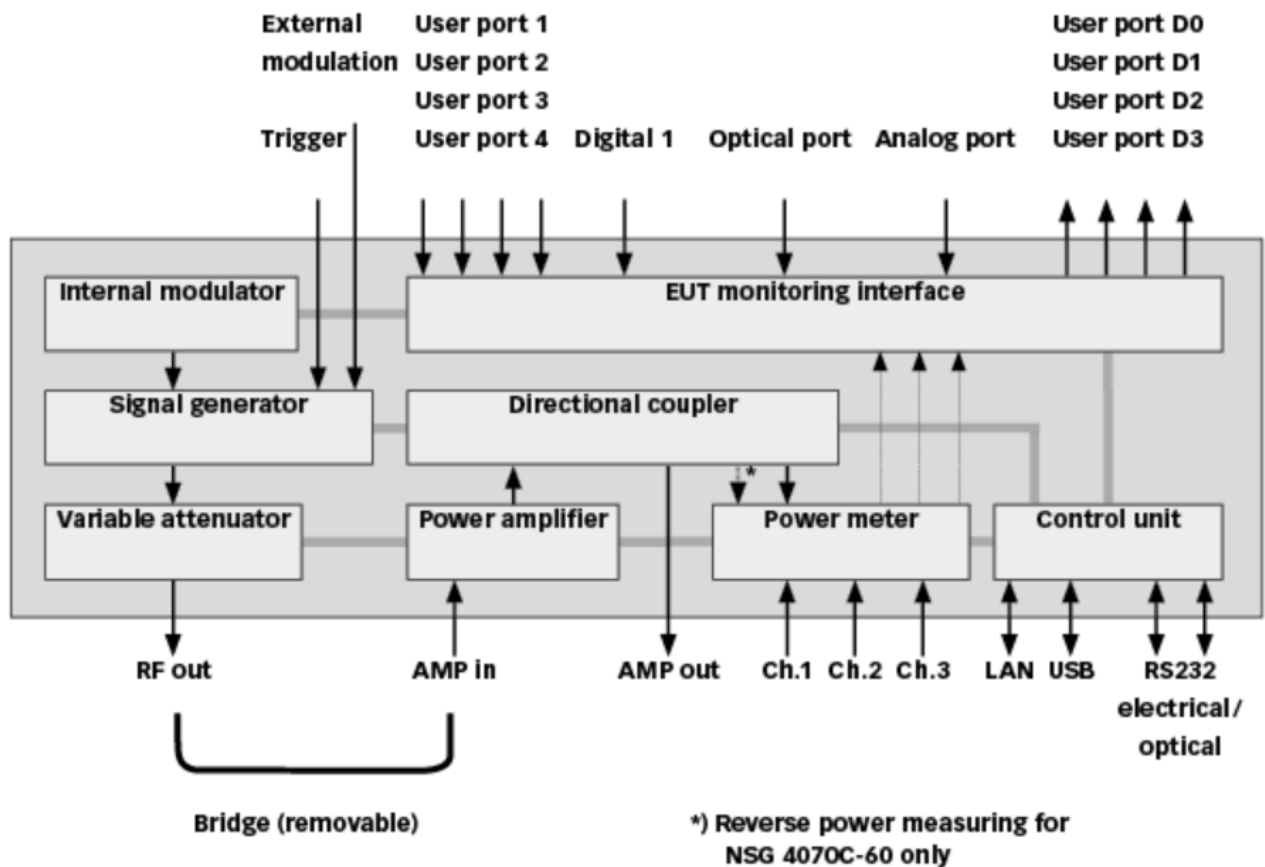


Figure 1. - Block diagram of NSG 4070 with internal power amplifier

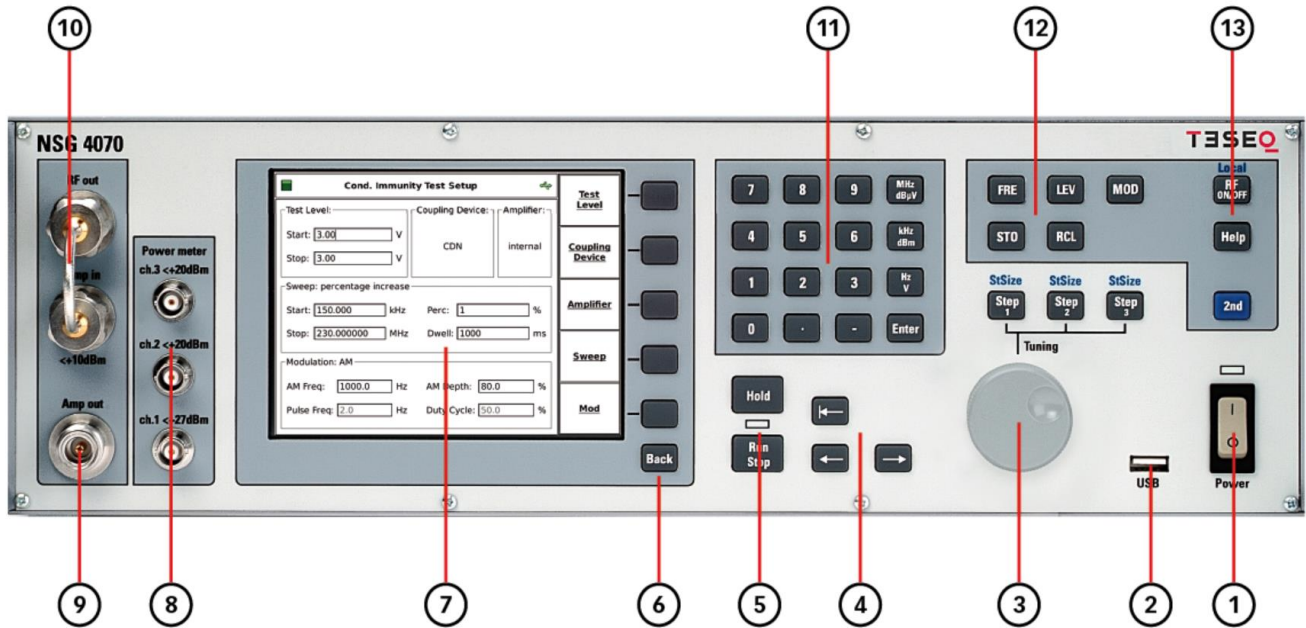


Figure 2. - Front panel and operating elements

Power on key, hard key, switching takes effect with a short delay

The LED next to the switch will turn from yellow to green when the unit is switched on.

USB, interface for data exchange with USB stick

The rotary knob has magnetic lock-in positions for parameter tuning and selection purposes.

2nd, additional function: marked in blue color, 2nd + local keys to switch from remote control to manual operation 2nd + StSize keys to change the step size, affects e.g. the using of the rotary knob

Delete the character left of the cursor, moves the cursor left or right

Hold interrupts a sweep. The blinking yellow LED indicates the Hold state. There is a RF signal at the output.

Run, starts the sweep specified in the setup. The blinking red LED indicates the RUN mode.

Stop, stops a sweep that is currently running. The LED turns to green.

5 Softkeys, whose individual functions are dependent on the menu context.

Back, key to return from any operating condition (menu, cancelling of entries, error messages) to the preceding higher-level menu.

Displays menus, softkeys and results.

Power meter inputs, impedance $Z = 50 \Omega$, BNC-socket, Caution! Maximum input level +20 dBm for channel 2 and 3. Maximum input level +27 dBm for channel 1. If necessary, use voltage limiters or attenuators.

Amp out, power amplifier output (the power amplifier is optional)

RF out, synthesizer output to drive an external amplifier or use the NSG 4070 generator function.

Amp in, power amplifier input (the power amplifier is optional) Caution! Maximum input level <+10 dBm.

Numeric entry keys, minus sign, decimal point, input confirmation keys for the desired unit

FRQ opens a softkey menu to change the frequency, LVL opens a softkey menu to change the test level,

MOD opens a softkey menu to change the modulation parameters, STO opens a softkey menu to store test data or configurations, RCL opens a softkey menu to load test data or configurations

RF ON / OFF switches the internal signal generator on / off, Help Key to call up the help text for all operating conditions. Depending on the current settings, explanations to the help function, explanations to hard and softkeys, and for adjustment facilities within menus will be displayed.

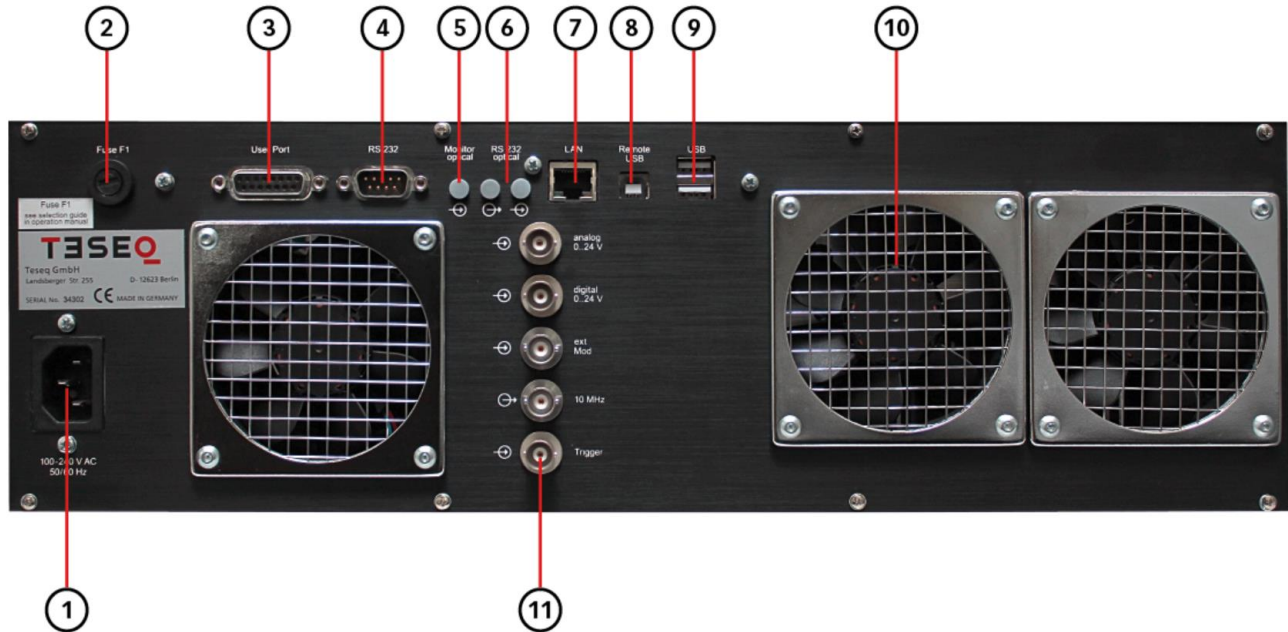


Figure 3. - Back panel

- 1) Power supply connector for wide range supply: 110 / 230 Volts, 50 / 60 Hz autoranging.
- 2) Fuse F1, see technical specifications for selection guide of fuse F1
- 3) User port D-Sub 15 pole

Port	Pin
Digital in 0	1
Digital in 1	2
Digital in 2	3
Digital in 3	4
Digital out 0	6
Digital out 1	7
Digital out 2	8
Digital out 3	9
+12 V	15
-12 V	14
+5 V	13
GND	5 and 10

- 4) RS232 - interface for remote control of the NSG 4070 using a null modem connection
- 5) Input for optical EUT Monitoring, Fiber optic cable plug, HP versatile link HFBR0501 series 40 kBd
- 6) Optical RS232 - interface for remote control of the NSG 4070 using USO 4013
- 7) Network connector 10 / 100 Ethernet
- 8) Remote USB, USB device connector
- 9) USB host connector
- 10) Fans for cooling the internal parts of the unit
- 11) BNC sockets
 - a) Monitoring input analog, BNC socket, 0-24 V $R_i=15\text{ k}\Omega$, 6 mV resolution
 - b) Monitoring digital input, BNC socket, 0-24 V via optical coupler $R_i=1.5\text{ k}\Omega$, switching threshold approx. 2 to 3 V
 - c) External modulation input, BNC socket, Impedance $>10\text{ k}\Omega$, Level: 1 Vpp / 100% AM: 1 Hz – 50 kHz
 - d) 10 MHz reference output, BNC socket, approx. 1 Vpp / 50 Ω . Please note: The connected signal will be mixed with the selected internal modulation. Disconnect this port for using the internal modulation only.
 - e) Trigger input, BNC socket, TTL for external triggering

4 Quick Start

Configuration

RCL

RF Off What do you want to recall?

NSG 4070C-60
Amplifier: 60 W 9 kHz - 400 MHz

T3SEQ

Config

System Cal.

Probe Cal.

Results

RF Off Folder

NSG 4070/

IEC 61000-4-6	14.11.17 16:19
ISO 11452	14.11.17 16:19
MIL-STD-461G	14.11.17 16:14
NAMUR	15.11.17 08:49

comment:

Open folder

Internal memory

RF Off Folder

NSG 4070/IEC 61000-4-6/

...	14.11.17 16:19
CDN	14.11.17 16:18
EM-Clamp	14.11.17 16:19

comment:

Open folder

Internal memory

RF Off Load File

NSG 4070/IEC 61000-4-6/CDN/

...	14.11.17 16:19
CDN_1V_150k_80M_1pro.cfg	05.12.13 00:00
CDN_1V_150k_80M_2Hz_1pro.cfg	05.12.13 00:00
CDN_1V_150k_230M_1pro.cfg	05.12.13 00:00
CDN_3V_150k_80M_1pro.cfg	05.12.13 00:00
CDN_3V_150k_80M_2Hz_1pro.cfg	05.12.13 00:00
CDN_3V_150k_230M_1pro.cfg	05.12.13 00:00
CDN_10V_150k_80M_1pro.cfg	05.12.13 00:00
CDN_10V_150k_80M_2Hz_1pro.cfg	05.12.13 00:00
CDN_10V_150k_230M_1pro.cfg	05.12.13 00:00

comment: CDN 3V 150k-80M 1pro internal amp

Load

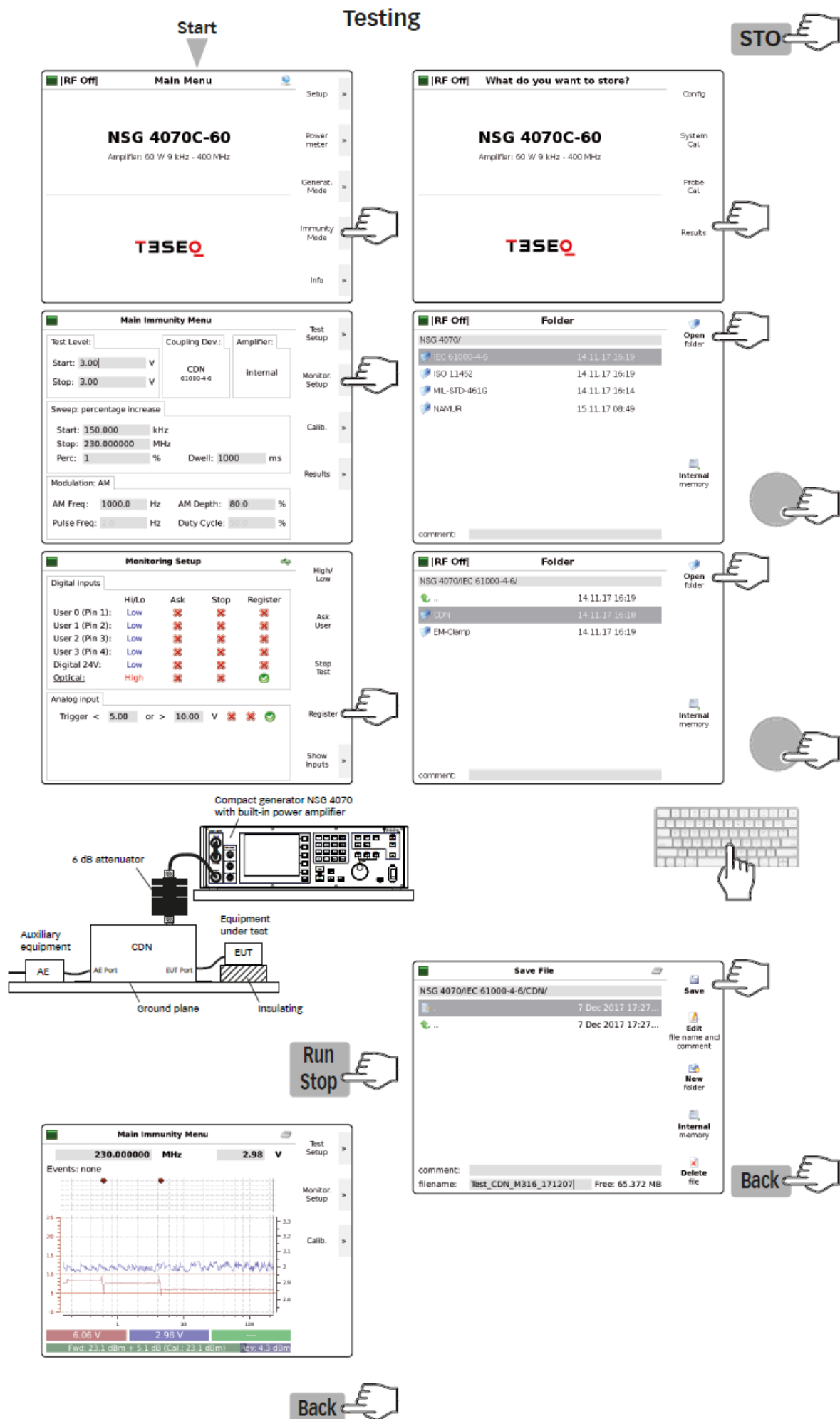
Internal memory

Back

System Calibration

Start **STOP**

[Frequency:]	[Forw. Power:]	[Rev. Power:]
222.833055 MHz	22.94 dBm	6.36 dBm
225.061386 MHz	23.05 dBm	5.96 dBm
227.311999 MHz	23.06 dBm	5.38 dBm
229.585119 MHz	23.11 dBm	4.64 dBm
230.000000 MHz	23.08 dBm	4.45 dBm



5 Remote



Connect the NSG 4070 with a suitable mains socket.

Switch the unit on.

Connect the NSG 4070 and USO 4013 to the PC.

Press "Setup".

Press "Remote".

Press "RS232 optical".

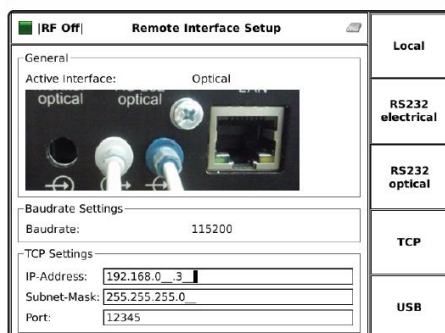
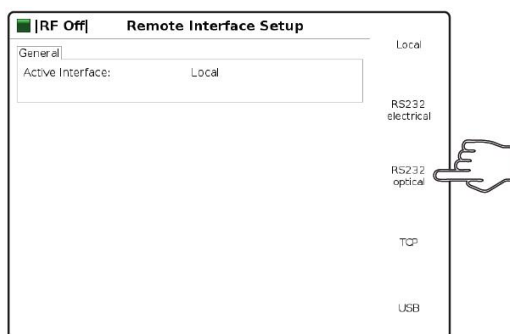
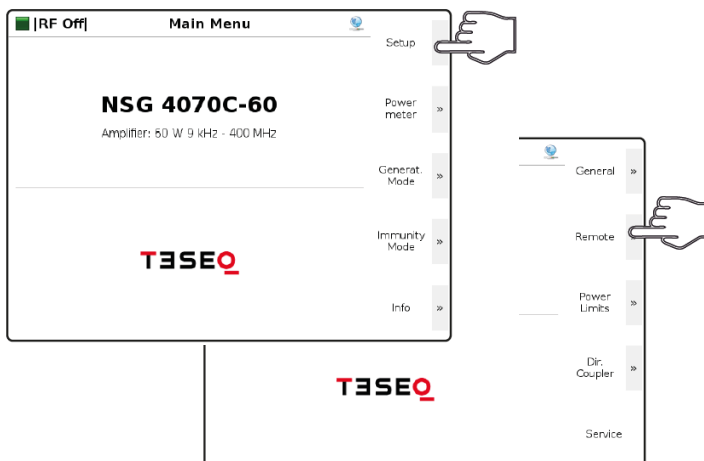
Press "Back".

Press "Baudrate setup".

Change the settings as required. (Default value is 11500 Baud)

Connect the NSG 4070, USO 4013 and PC as shown in the figure.

The device manager under Windows 10 shows the USO 4013 after successful driver installation. The port number, in the example COM 4, must be entered in the application software.



Back

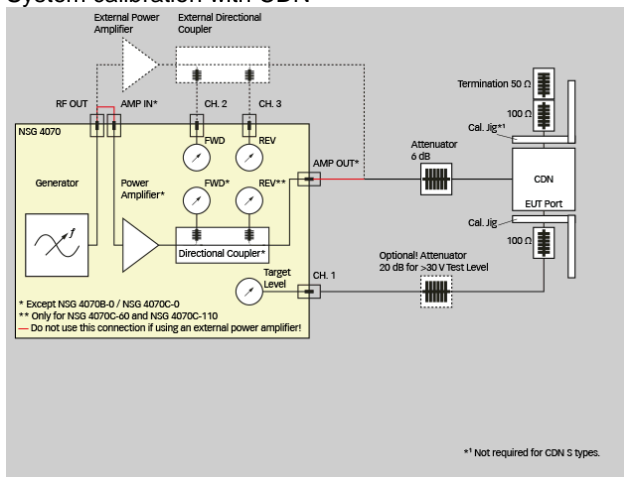
- ▼ Anschlüsse (COM & LPT)
 - ECP-Druckeranschluss (LPT1)
 - Intel(R) Active Management Technol
 - Kommunikationsanschluss (COM1)
 - Seriellles USB-Gerät (COM18)
 - Teseq USO 4013 (COM4)



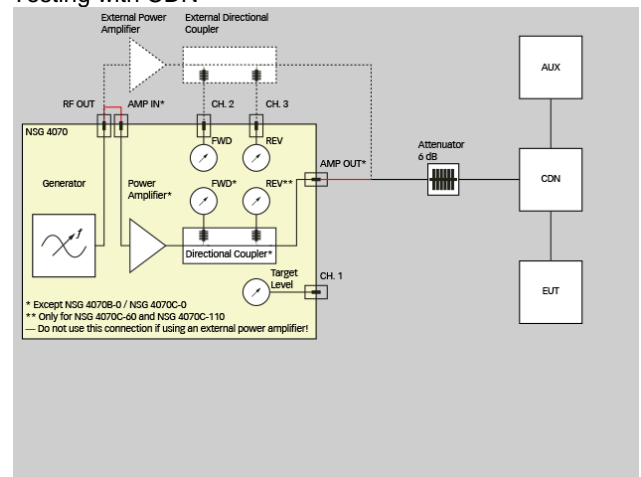
6 Applications

6.1 IEC 61000-4-6

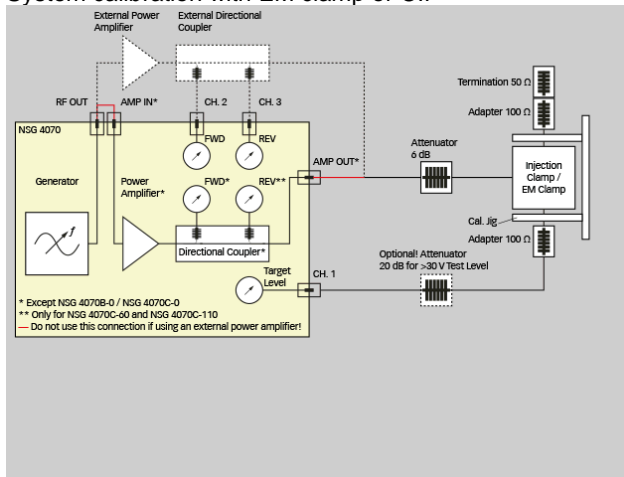
System calibration with CDN



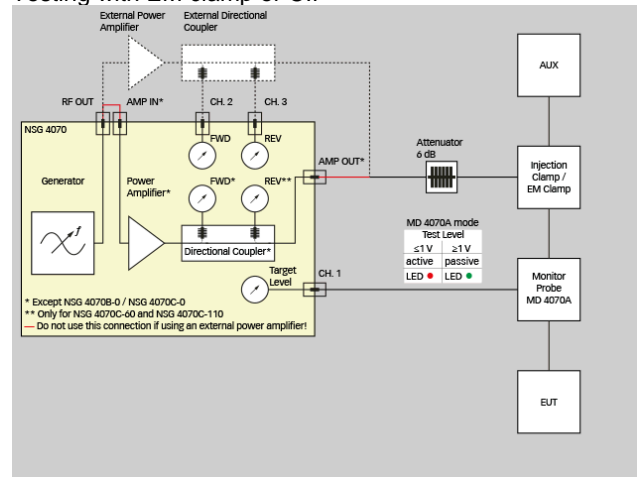
Testing with CDN



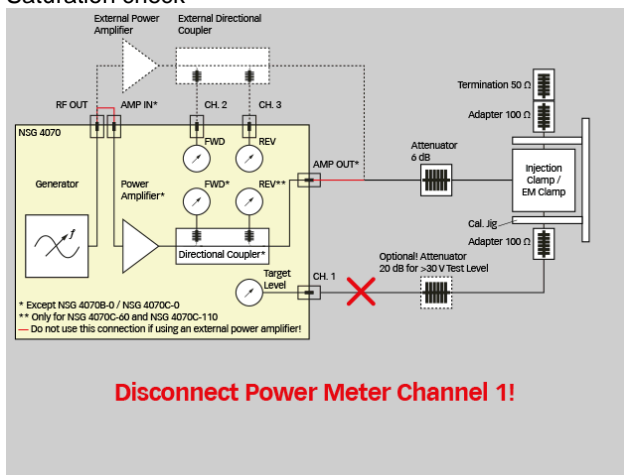
System calibration with EM clamp or CIP



Testing with EM clamp or CIP

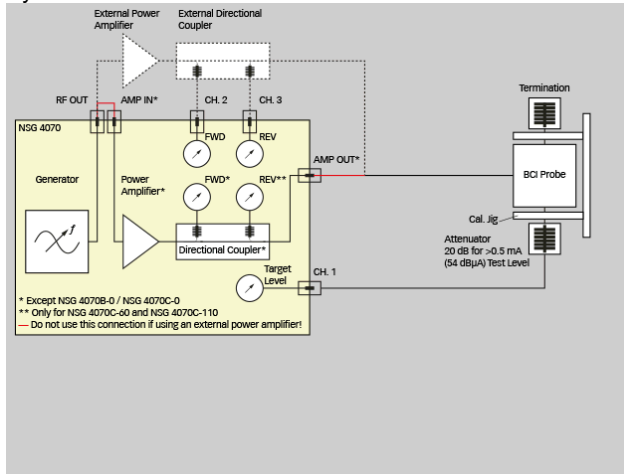


Saturation check

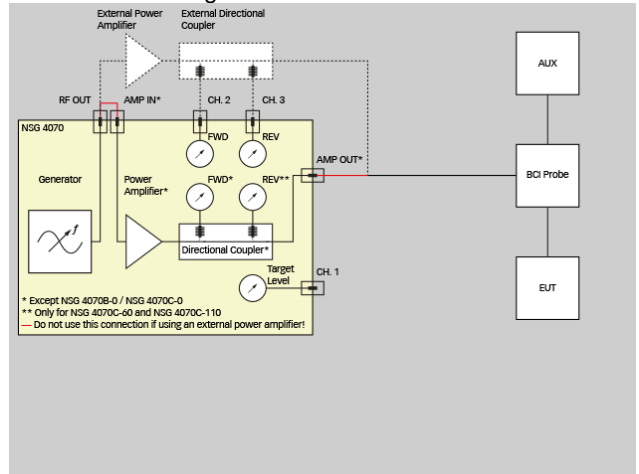


6.2 BCI according ISO 11452-4

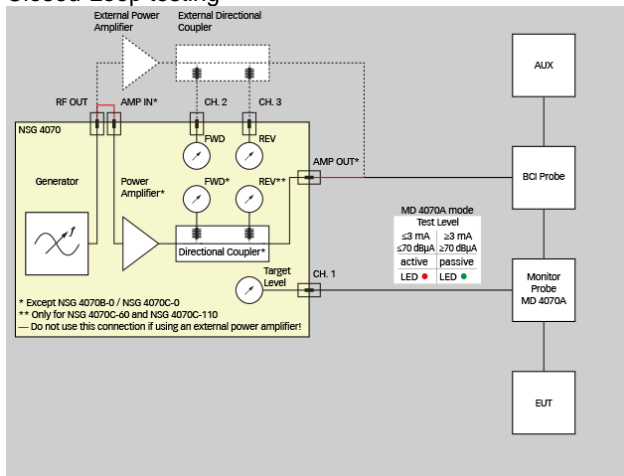
System calibration



Substitution testing

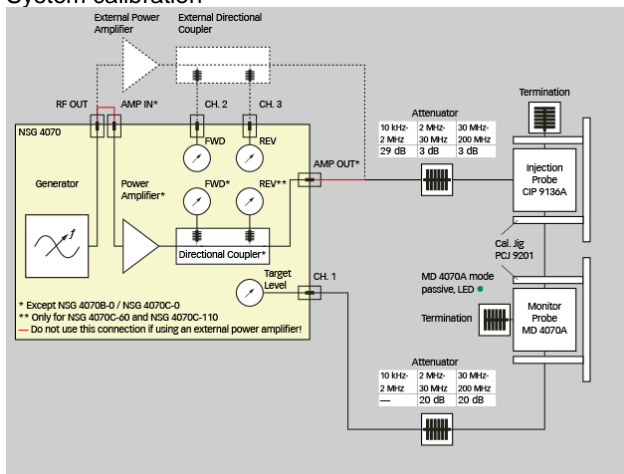


Closed-Loop testing

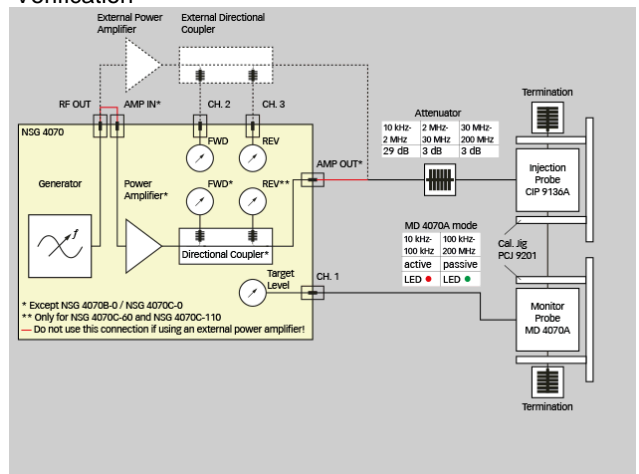


6.3 BCI according MIL-STD-461G CS114, example Level 2, 5, 5

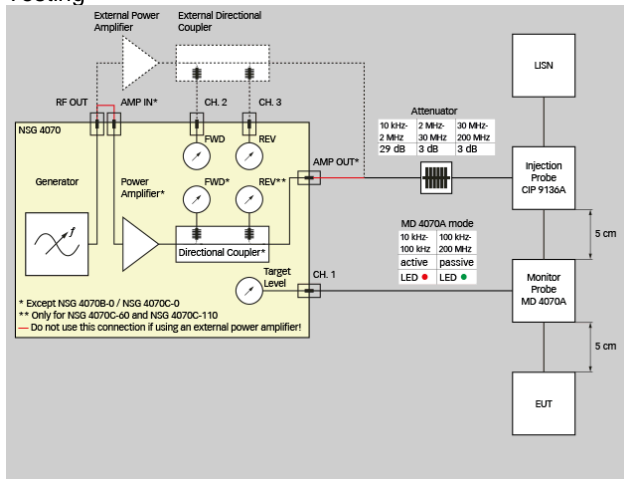
System calibration



Verification

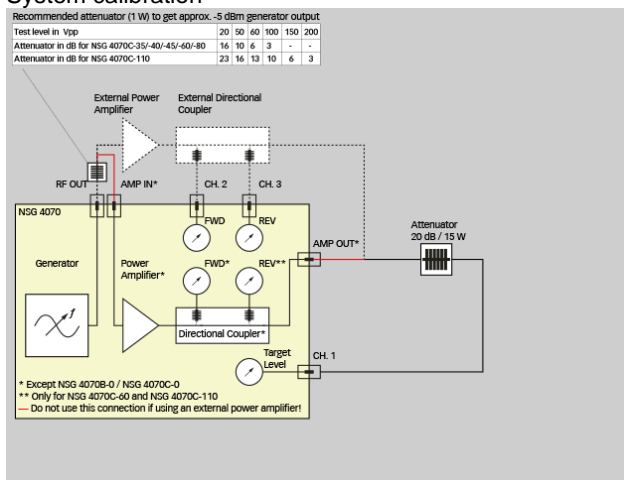


Testing

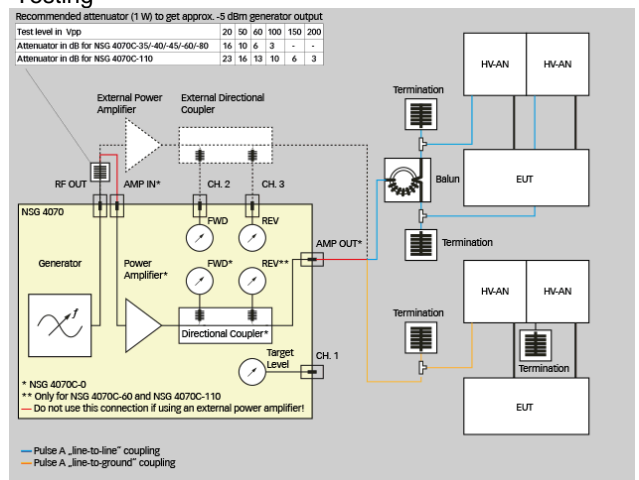


6.4 ISO/DTS 7637-4 Pulse A

System calibration

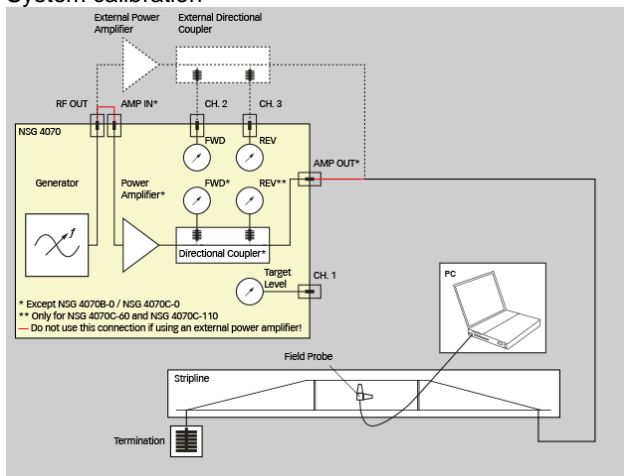


Testing

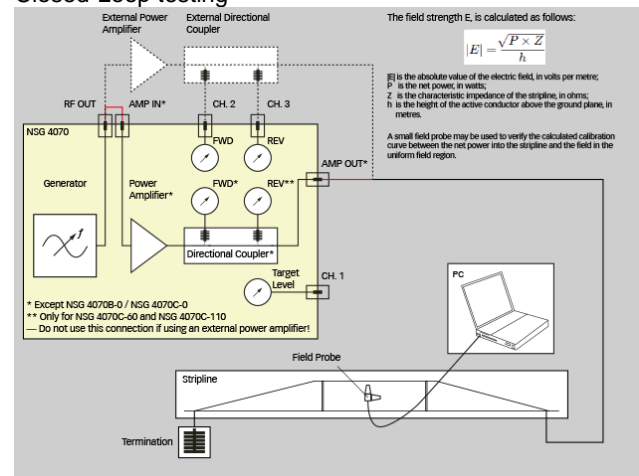


6.5 ISO 11452-5

System calibration



Closed-Loop testing



7 Maintenance

7.1 General

The NSG 4070 including accessories does not require any special maintenance. Maintenance is limited to cleaning the contacts and air inlets and outlets. The service life of the connectors is limited due to the durability of the contacts. AMETEK CTS can replace the worn connectors.

No modifications may be made to the NSG 4070 and accessories by the user.

7.2 Cleaning

The cleaning shall be done with dry cloth. If a wet cleaning would become necessary, make sure that no humidity will enter inside of the unit and clean the instrument housing with a damp cloth using a little mild, non-abrasive household cleanser if necessary. Chemicals must not be used for cleaning purposes.