R&S®NRP / R&S®NRQ
USB and LAN Power Sensors
Instrument Security Procedures

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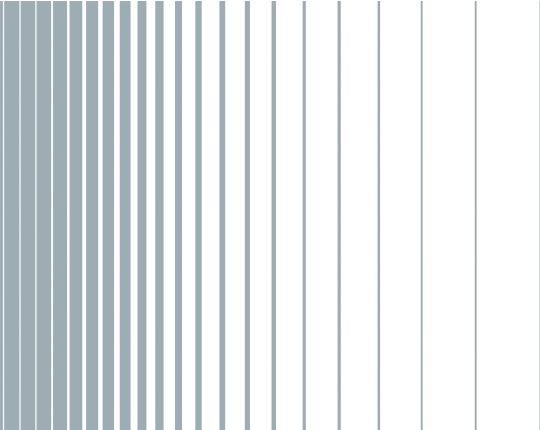
ROHDE & SCHWARZ

This document describes the types of memory and their usage of the R&S®NRPxxx(N) and R&S®NRQx Power Sensors.

Throughout this manual, products from Rohde & Schwarz are indicated without the ® symbol , e.g. R&S®NRP18SN is indicated as R&S NRP18SN. The R&S NRPxxx(N) or R&S NRQx power sensors are also referred to as instrument.

Contents

1 Overview

It is often imperative that R&S NRPxxx(N) or R&S NRQx power sensors are used in a secured environment. Generally these highly secured environments do not allow any test equipment to leave the area unless it can be proven that no user information leaves with the test equipment. Security concerns can arise when devices need to leave a secured area, e.g. to be calibrated or serviced.

This document describes the types of memory and their usage in the R&S NRPxxx(N) or R&S NRQx. It provides a statement regarding the volatility of all memory types and specifies the steps required to declassify an instrument through memory clearing or sanitization procedures. These sanitization procedures are designed for customers who need to meet the requirements specified by the US Defense Security Service (DSS).

2 Instrument Models Covered

Table 2-1: R&S NRPxxS(N) / R&S NRPxxA(N) / R&S NRPxxT(N) / R&S NRPxxTWG / R&S NRQx power sensors

Product name	Order number
R&S NRPxxS(N)	
R&S NRP8S	1419.0006.02
R&S NRP8SN	1419.0012.02
R&S NRP18S	1419.0029.02
R&S NRP18SN	1419.0035.02
R&S NRP18S-10	1424.6721.02
R&S NRP18S-20	1424.6738.02
R&S NRP18S-25	1424.6744.02
R&S NRP33S	1419.0064.02
R&S NRP33SN	1419.0070.02
R&S NRP33SN-V	1419.0129.02
R&S NRP40S	1419.0041.02
R&S NRP40SN	1419.0058.02
R&S NRP50S	1419.0087.02
R&S NRP50SN	1419.0093.02
R&S NRPxxA(N)	
R&S NRP6A	1424.6796.02
R&S NRP6AN	1424.6809.02
R&S NRP18A	1424.6815.02
R&S NRP18AN	1424.6821.02
R&S NRPxxT(N)	
R&S NRP18T	1424.6115.02
R&S NRP18TN	1424.6121.02
R&S NRP33T	1424.6138.02
R&S NRP33TN	1424.6144.02
R&S NRP40T	1424.6150.02
R&S NRP40TN	1424.6167.02
R&S NRP50T	1424.6173.02
R&S NRP50TN	1424.6180.02
R&S NRP67T	1424.6196.02

Product name	Order number
R&S NRP67TN	1424.6209.02
R&S NRP110T	1424.6215.02
R&S NRPxxTWG	
R&S NRP75TWG	1700.2529.02
R&S NRP90TWG	1700.2312.02
R&S NRP110TWG	1173.8709.02
R&S NRQx	
R&S NRQ6	1421.3509.02

3 Security Terms and Definitions

Clearing

The term "clearing" is defined in Section 8-301a of DoD 5220.22-M, "National Industrial Security Program Operating Manual (NISPOM)". Clearing is the process of eradicating the data on media so that the data can no longer be retrieved using the standard interfaces on the instrument. Therefore, clearing is typically used when the instrument is to remain in an environment with an acceptable level of protection.

Sanitization

The term "sanitization" is defined in Section 8-301b of DoD 5220.22-M, "National Industrial Security Program Operating Manual (NISPOM)". Sanitization is the process of removing or eradicating stored data so that the data cannot be recovered using any known technology. Instrument sanitization is typically required when an instrument is moved from a secure to a non-secure environment, such as when it is returned for service of calibration.

The memory sanitization procedures described in this document are designed for customers who need to meet the requirements specified by the US Defense Security Service (DSS). These requirements are specified in the "Clearing and Sanitization Matrix" in Section 14.1.16 of the ISFO "Manual for the Certification and Accreditation of Classified Systems under the NISPOM".

Instrument declassification

The term "instrument declassification" refers to procedures that must be undertaken before an instrument can be removed from a secure environment, for example when the instrument is returned for calibration. Declassification procedures include memory sanitization or memory removal, or both. The declassification procedures described in this document are designed to meet the requirements specified in DoD 5220.22-M, "National Industrial Security Program Operating Manual (NISPOM)", Chapter 8.

4 Types of Memory and Information Storage

The following table provides an overview of the memory components that are part of your instrument.

Table 4-1: R&S NRPxxx(N) / R&S NRPxxTWG

Memory type	Size	Content	Volatility	User data	Sanitization procedure
OCRAM (Main processor)	256 kbyte	Boot code	Volatile	No	Turn off instrument power (disconnect USB / LAN)
Block RAM (Main processor, FPGA)	0.5 Mbyte	FPGA to control the power sensor operation	Volatile	Yes	Turn off instrument power (disconnect USB / LAN)
SDRAM	512 Mbyte	• Operating system • Firmware • FPGA to control the power sensor operation	Volatile	Yes	Turn off instrument power (disconnect USB / LAN)
Flash	16 Mbyte	• Bootloader • FPGA configuration • OS Kernel	Non-volatile	No	None required
	16 Mbyte	Temporary storage for firmware during sanitization		No	
	32 Mbyte	JFFS2 file system: • Operating system • Main application • Calibration data • Instrument settings • Product options		Yes	See Chapter 5, "Secure Erase Procedures", on page 12
SRAM (COMM processor)	52 kbyte	Communication and interface protocols (USB)	Volatile	Yes	Turn off instrument power (disconnect USB / LAN)
Flash (COMM processor)	256 kbyte	• Firmware for communication channels (USB) • Sensor-specific data	Non-volatile	No	None required

Table 4-2: R&S NRQx

Memory type	Size	Content	Volatility	User data	Sanitization procedure
OCRAM (Main processor)	256 kbyte	Boot code	Volatile	No	Turn off instrument power (disconnect USB / LAN)
Block RAM (Main processor, FPGA)	2 Mbyte	FPGA to control the power sensor operation	Volatile	Yes	Turn off instrument power (disconnect USB / LAN)
SDRAM	512 Mbyte	• Operating system • Firmware • FPGA to control the power sensor operation	Volatile	Yes	Turn off instrument power (disconnect USB / LAN)
Flash	32 Mbyte	• Bootloader • FPGA configuration • OS Kernel	Non-volatile	No	None required
	32 Mbyte	Temporary storage for firmware during sanitization		No	
	64 Mbyte	JFFS2 file system: • Operating system • Main application • Calibration data • Instrument settings • Product options		Yes	See Chapter 5, "Secure Erase Procedures", on page 12
RAM (PLD)	8 kbyte	Internal memory for peripherals control	Volatile	Yes	Turn off instrument power (disconnect USB / LAN)
Flash (PLD)	42 kbyte	Firmware for peripherals control	Non-volatile	No	None required
SRAM (COMM processor)	52 kbyte	Communication and interface protocols (USB)	Volatile	Yes	Turn off instrument power (disconnect USB / LAN)
Flash (COMM processor)	256 kbyte	• Firmware for communication channels (USB) • Sensor-specific data	Non-volatile	No	None required

4.1 Volatile Memory

The volatile memory in the R&S power sensor does not have battery backup. It loses its contents as soon as power is removed from the instrument. The volatile memory is not a security concern.

Removing power from this memory meets the memory sanitization requirements specified in the "Clearing and Sanitization Matrix" in section 5.2.5.5.5 of the ISFO "Manual for the Certification and Accreditation of Classified Systems under the NISPOM".

4.2 Non-Volatile Memory

The R&S power sensors contain various non-volatile memories. This type of memory is not erased when power is removed from the instrument. Non-volatile memories which contain user data can pose a security risk.

All other non-volatile memories of the R&S power sensors are not a security concern.

Flash (main processor)

The Flash memory contains user data and instrument configuration data.

Sanitization procedure: see Secure Erase Procedures.

5 Secure Erase Procedures

The R&S power sensors provide a sanitizing procedure that removes user data irretrievably from the instrument.

The Secure Erase Procedures meet the memory sanitization requirements specified in the "Clearing and Sanitization Matrix" in section 14.1.16 of the ISFO "Manual for the Certification and Accreditation of Classified Systems under the NISPOM".

5.1 Starting the Sanitization

You have different options to start the sanitizing procedure:

* by I/O remote control commands, see Remote I/O
* by the R&S Power Meter Sanitization Tool

5.1.1 Remote I/O

To sanitize the internal memory:

1. Connect the R&S power sensor via LAN or USB to a controller PC.

2. Start a controller application program on the PC.

3. Before starting the sanitization procedure, we recommend that you read out the status of the last sanitization.
   Send the following commands:
   ```
   SERVice:UNLock 1234              // enables service functions
   SERVice:SECure:ERASe:STATus?
   ```
   Returns the number of the executed sanitization cycles so far, and the status/error information of the last sanitization, e.g. `"Counter:2","Error:none"`.
   Keep the counter in mind.

4. Send the following remote I/O command sequence to the instrument:
   ```
   SERVice:UNLock 1234
   SERVice:SECure:ERASe
   ```
   The procedure "Sanitize internal memory" starts. The instrument indicates the currently performed action and its progress, see Chapter 5.2, "Sanitization Procedure", on page 13.

5. When completed, you can query the result with the following command sequence:
   ```
   SERVice:UNLock 1234
   SERVice:SECure:ERASe:STATus?
   ```
   Check if the counter has incremented by 1 after sanitization.

5.1.2 R&S Power Meter Sanitization Tool

As an alternative to sending the sanitization commands to the R&S power sensor (as described in Chapter 5.1.1, "Remote I/O", on page 12), you can use the R&S Power Meter Sanitization Tool which is provided for download on the Rohde & Schwarz Internet.

This tool requires Microsoft®Windows 7 or Microsoft®Windows 10 and an installed VISA library.

Rohde & Schwarz provides the VISA library free of charge for download on the Internet, see http://www.rohde-schwarz.com/rsvisa.

This section briefly explains the main steps you need to take for sanitizing when using the R&S Power Meter Sanitization Tool.

For detailed user instructions, including download and installation of the application, see Chapter A, "R&S Power Meter Sanitization Tool", on page 15.

To sanitize the internal memory:

1. Start the tool.

   The R&S Power Meter Sanitization Tool scans automatically for instruments connected via USB. For instruments connected via LAN, enter the corresponding address information to add the instrument to the list.

2. Select the instrument from the list.

3. Start the sanitizing.

   The R&S Power Meter Sanitization Tool confirms with a message when completed.

5.2 Sanitization Procedure

To sanitize the memory, start the secure erase procedure as described in Chapter 5.1, "Starting the Sanitization", on page 12

The sanitization lasts approximately 10 minutes.

The R&S power sensor indicates the running action by flashing a white LED (with a 3 sec period).

The procedure executes the following actions:

- Saves the instrument firmware (including the product options) temporarily.
- Erases the JFFS2 partition (flash erase).
- Overwrites each addressable location of the JFFS2 partition by 0x00 (binary zero) characters.
- Erases the JFFS2 partition again.
- Recreates the JFFS2 file system and restores the instrument firmware.

6 Instrument Declassification

Before you can remove the R&S NRPxxx(N) or R&S NRQx power sensor from a secured area (for example to perform service or calibration), all classified user data needs to be removed.

To declassify the R&S power sensor:

1. Execute the sanitization procedure, as described in Chapter 5, "Secure Erase Procedures", on page 12.

2. After sanitization, remove the power source from the instrument.

Following these steps removes all user data from the R&S power sensor. The instrument can now leave the secured area.

These declassification procedures meet the needs of customers working in secured areas.

Validity of instrument calibration after declassification

During the declassification procedure, the factory calibration data of the instrument is saved and later restored for recalibration. The instrument remains fully functional after declassification.

If an instrument has no saved factory calibration data, the user data including the calibration data is erased from the instrument. In this case, the instrument comes up with a red flashing LED in Failsafe Mode. For recalibration, it is necessary to contact the Rohde & Schwarz Backup Service to get the factory calibration data of the instrument. After the calibration data are written to the instrument, it is fully functional for recalibration.

Security status after declassification

Be aware that sanitization clears all security settings. In particular, it resets all passwords to factory values.

Annex

A R&S Power Meter Sanitization Tool

R&S Power Meter Sanitization Tool is a PC application that helps you to declassify a Rohde & Schwarz instrument before it leaves a secure environment. The application executes a procedure that removes all user data from the instrument.

This declassification procedure meets the needs of customers working in a secured area.

Instruments covered

You can use the R&S Power Meter Sanitization Tool to sanitize the following instruments:

* R&S NRX / R&S NRT2, power meters
* R&S NRPxxx / R&S NRPxxxN / R&S NRQx, USB and LAN power sensors
* R&S NRPCxx / R&S NRPCxx-B1 / R&S NRPC-LS, power sensor calibration kits

A.1 Setting Up the R&S Power Meter Sanitization Tool

The R&S Power Meter Sanitization Tool runs on PCs with Microsoft®Windows 7 or Microsoft®Windows 10 operating system with an installed VISA library.

Rohde & Schwarz provides the VISA library free of charge for download on the Internet, see http://www.rohde-schwarz.com/rsvisa.

The R&S Power Meter Sanitization Tool is available free of charge also. You can download the program file `NrpSanitization-Installer_x.x.xxxx.xxxx.exe`[1] from the product page of any of the supported instruments, e.g. www.rohde-schwarz.com/software/nrp18sn.

([1] xx stands for the current version of the application)

The installer program contains all components required for installation and operation of the R&S Power Meter Sanitization Tool.
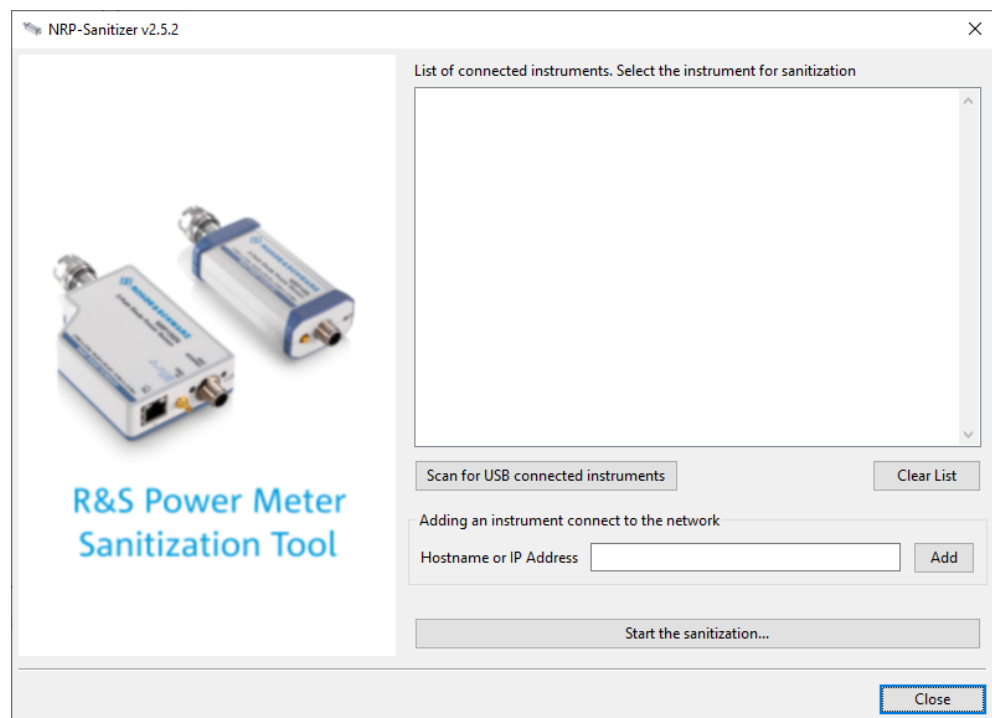
To install the application:

1. Download the latest version of the R&S Power Meter Sanitization Tool installer program.

2. Execute `NrpSanitization-Installer_x.x.xxxx.xxxx.exe` and follow the instructions of the installation wizard.

   The setup program checks if a VISA library is available and installs the application files.
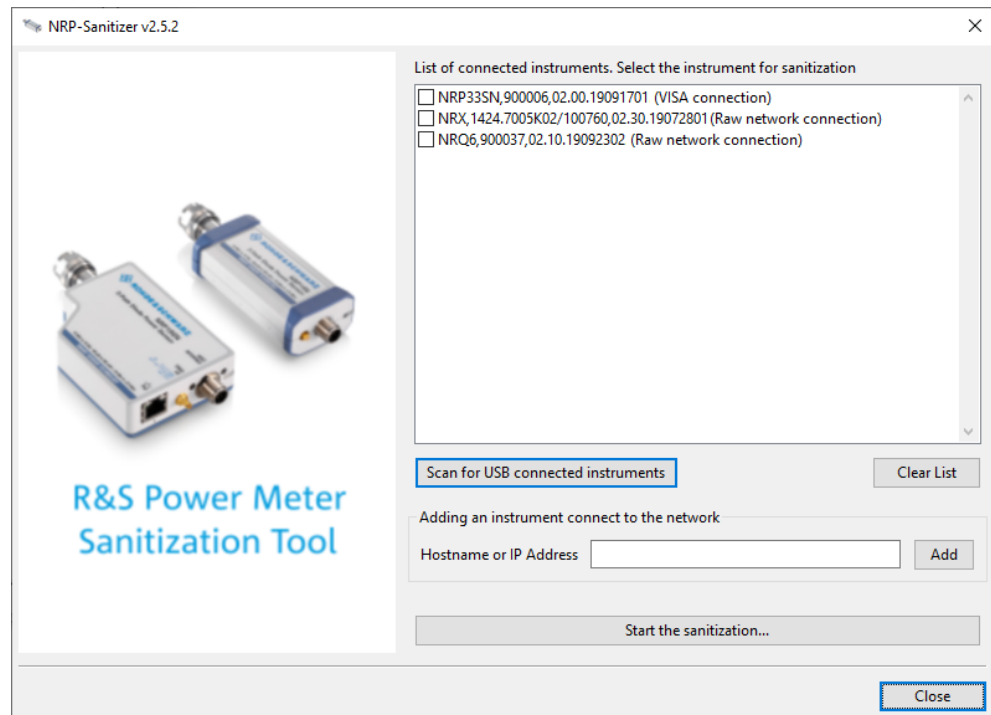
A.2 Starting the Sanitization

After downloading the installer file to your PC and installing the R&S Power Meter Sanitization Tool, perform the following steps:
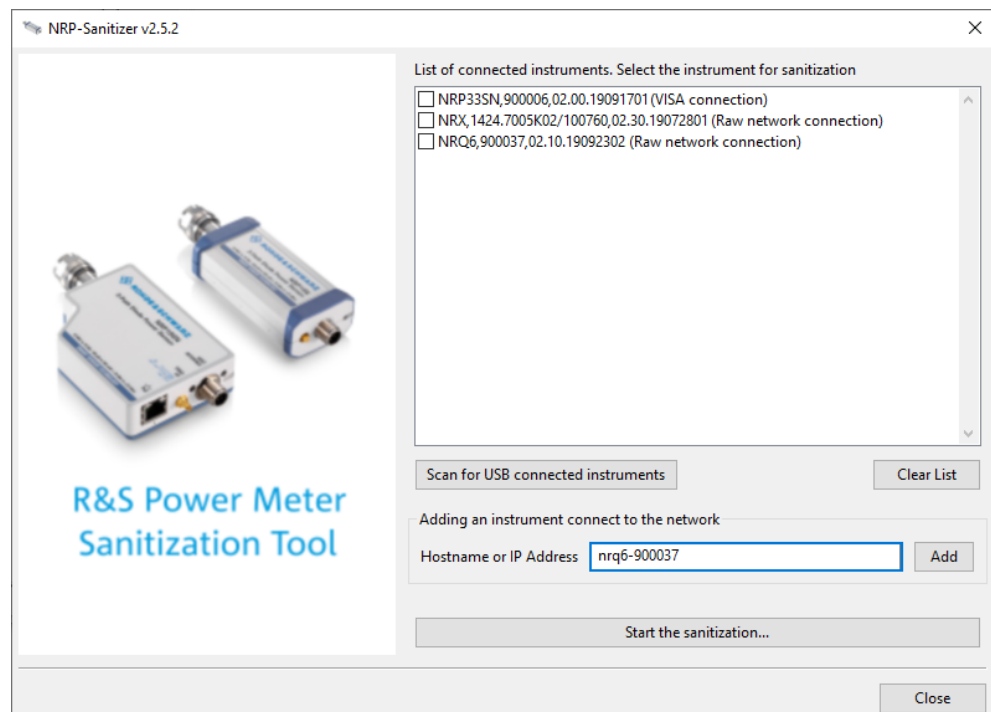
1. Start the application.

2. To search for USB connected instruments, select "Scan for USB connected instruments".

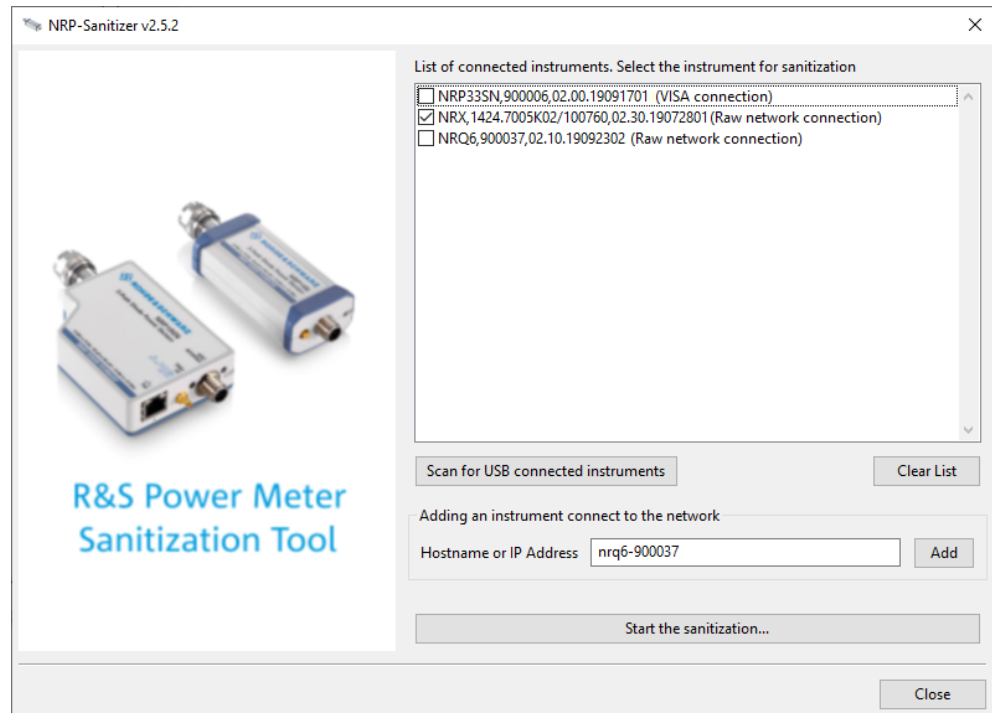The application lists all supported instruments connected to the USB interfaces.

3. For instruments connected to the LAN, enter the corresponding address information in the "Hostname or IP Address" field.
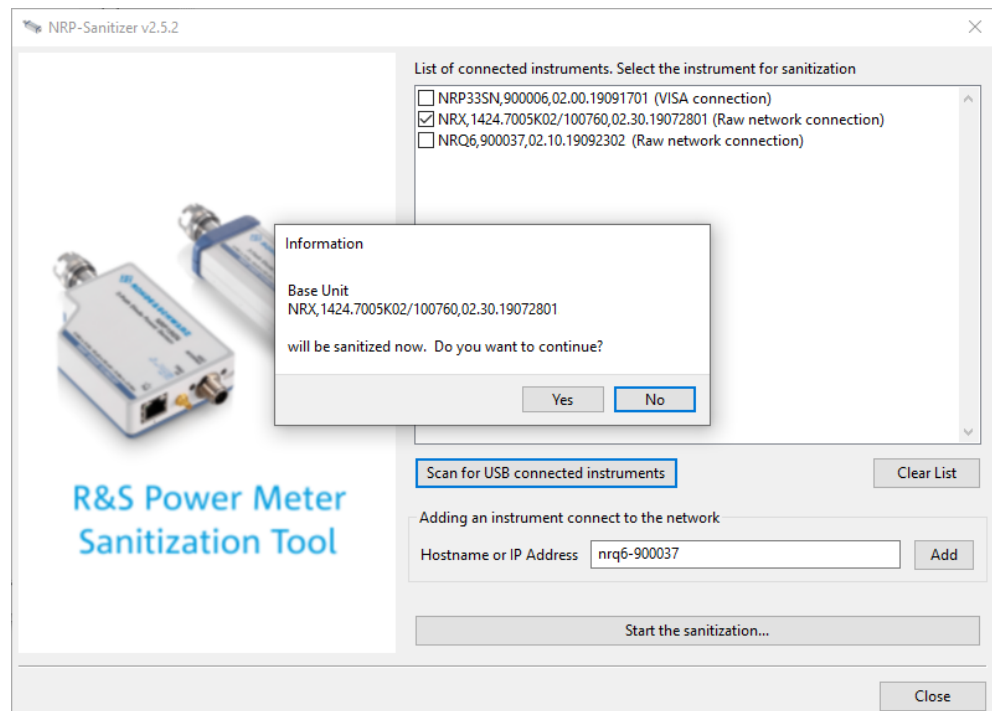

4. Confirm with "Add".

The application adds the instrument to the list.
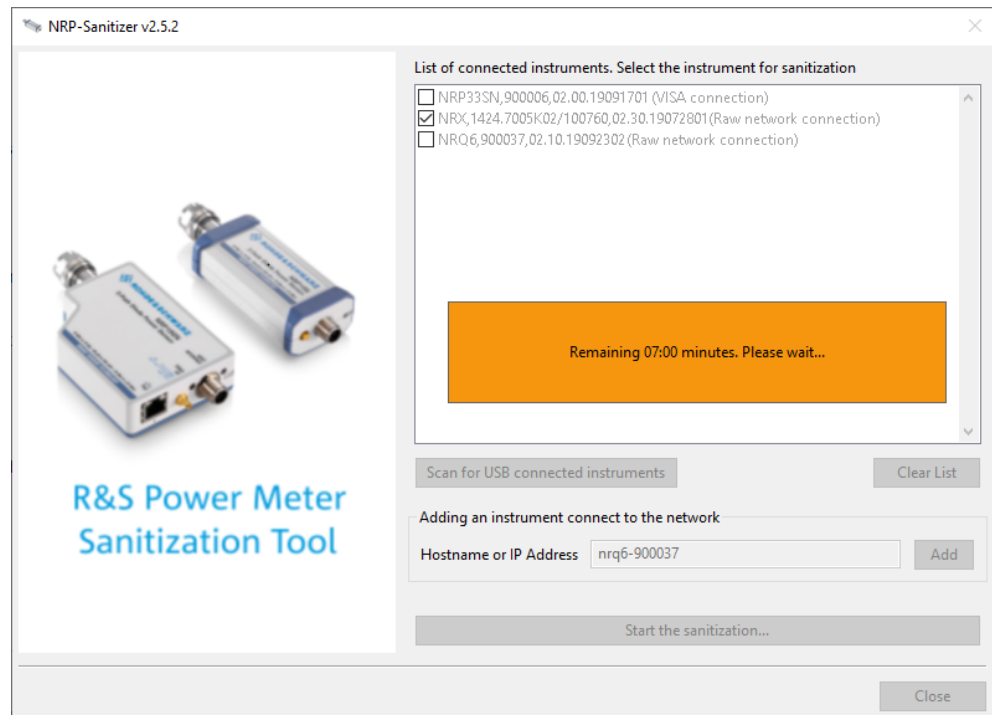
5. Select the instrument you need to sanitize from the list.

6. "Start the sanitization..." and confirm the execution.

The sanitization lasts approximately 10 minutes.

7. The R&S Power Meter Sanitization Tool also validates the sanitization and confirmes with a message when it is completed.