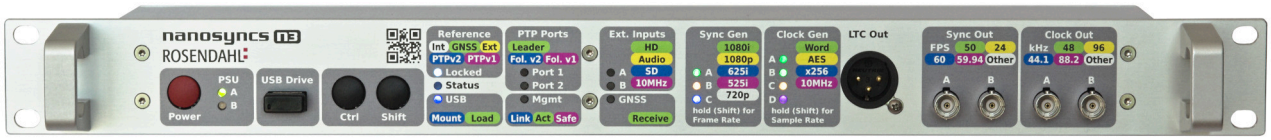
nanosyncs n3



nanosyncs n3 is a multistandard sync engine.

Synchronous clocking is foundational for professional audio/video environments for coherent recording, playback and processing of data.

As a highly integrated reference generator, PTP Grandmaster or Boundary Clock and NTP server, n3 synchronises a wide range of applications.

Manual 3-3-b for firmware versions 3.3.x

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Quick Start

Connect the power supply to one of the rear USB C PSU connectors. If the unit does not turn on immediately, press the Power button. The front panel PSU indicator will turn Green. Note: It is Red if the supply voltage is too low (5 Volts).

Connect an Ethernet cable to the rear port labeled Mgmt 100BASE. The 3 options to connect are APIPA, DHCP or Static.

APIPA

Connect the Ethernet cable directly to a Computer. On the front panel hold the Shift button to see Mgmt IP assignment: Purple means APIPA is active. In this state n3 is reachable under `169.254.1xx.yy` where xxyy is the serial number. Example: Serial #123 will have an address `169.254.101.23`.

DHCP

Connect the Ethernet cable to a network with a DHCP server. On the front panel hold the Shift button to see Mgmt IP assignment: Blue means DHCP has acquired a lease.

Static

Connect the Ethernet cable to a network. Remove the USB Drive from the front panel. Edit/Create the `NANOCFG.TXT` file on this or any other FAT32 thumb drive. After `ip_mgmt=` enter a static address. Example: `ip_mgmt=192.168.0.3`
Insert the drive again, USB should indicate Mount. Hold the Ctrl button for 4 seconds, USB will show Load when configuration is loaded. Hold the Shift button to check if Mgmt IP assignment is now Static.

Once the address is known, access the web interface with a browser. Example: `http://192.168.0.3/` or `http://n3-0123.local/`
The .local host name is unique and can be found on the front panel. Accessing by host name requires your local network and device to support multicast DNS (mDNS).

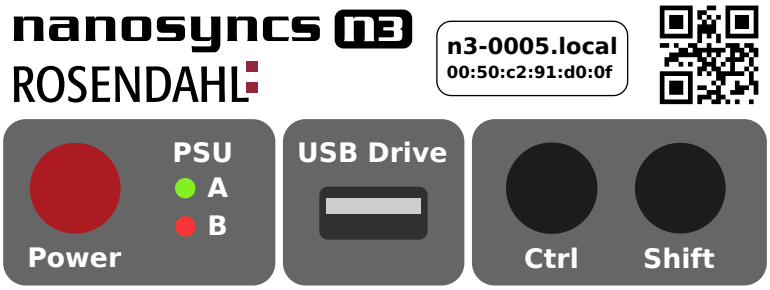
1. Hardware Description

The package contents are:

- 1 nanosyncs n3 unit, with 4GB USB Drive
- 1 USB-C to USB-C cable 1m
- 1 USB-C PD power supply 45W
- Quick Start and compliance sheet

1.1. Front Panel

Please note: n3 is designed to be configured using the web page hosted on the Management Port, see Section 2.1. The front panel displays most operating parameters, but will not allow you to change them.



The unique host name / serial number is located between logo and QR code. For example, serial #321 will be assigned `n3-0321.local` (via mDNS). The 48-bit MAC address of Mgmt can also be found. The MAC addresses of PTP Ports 1 and 2 are always equal to this value +1 and +2, respectively.

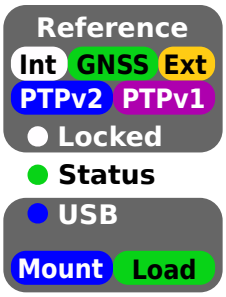
Press Power button briefly to turn on, hold to turn off. This button can be disabled in the web interface to prevent unwanted shutdowns.

There are two independent PSU LEDs for the two DC inputs. The LED is Red if the voltage is too low, for example when a regular 5V supply is connected. It is Green in the acceptable voltage range of 9 to 12V. In recovery mode (see Section 2.1.1), the Green light is alternating between A/B/A/B/A.. and so on.

USB Drive is used for configuration and logging, but is not required for operation.

The Ctrl button is used for configuration. Hold for 4 seconds to load the configuration file on the USB Drive. This button can be disabled in the web interface to prevent unwanted changes.

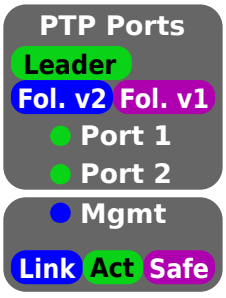
Hold Shift button to display more information on the front panel LEDs. Hold it during startup to enter recovery mode (see Section 2.1.1). Otherwise, it has no effect on normal operation.



The color of the Locked LED shows the current reference. On means locked, blinking means jumping/acquiring, Off means the reference is unavailable (For example, no signal or PTP is not a follower). Hold Shift to see the selected reference, regardless of lock or availability. See Section 3 for more information.

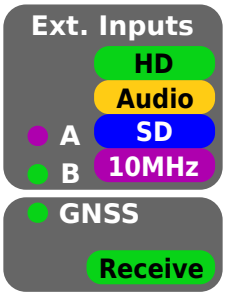
Status displays the general operational state: Green when no faults are detected, Red if an error occured. In this case, the web interface will contain more information.

USB shows Mount when the filesystem on the USB Drive has been mounted successfully. In this state, system messages are written to log file. Sucessfully loading a configuration from the drive shows Load for a short time.



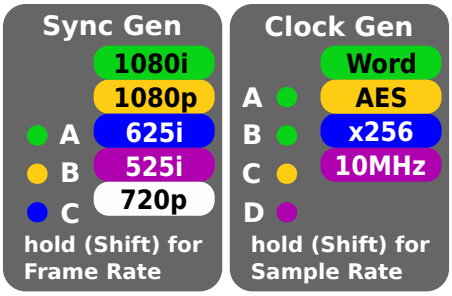
The physical PTP Ports have two independent LEDs, one each. Fol.v2 means the logical port of the PTPv2 instance is a Follower. Fol.v1 means the logical port of the PTPv1 instance is a Follower. Leader means the port is a Leader. All ports of a PTP domain's Grandmaster are typically in the Leader state. Red means Ethernet issue: Most likely the link partner is not capable of full-duplex 1000BASE-T. See Section 2.2 for more information.

On Mgmt an Ethernet link is shown as Link. When a user is connected, i.e. the web interface is open in a browser, the color changes to Act. Hold Shift to see IPv4 address category: APIPA, DHCP, Static or Initializing (active for a few seconds after link up).



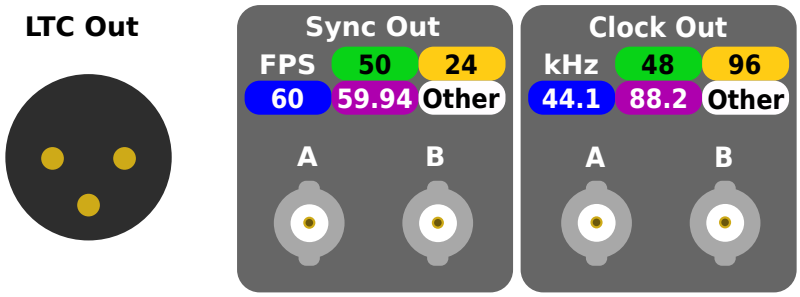
The two Ext. Inputs (A, B) independently accept reference signals and display the detected signal type: HD trilevel or SD bi-level video sync, Audio WC FS1/2/4/256 or 10MHz. Hold Shift to see if the signal frequency is 50fps, 24fps, 60fps, 59.94fps, 48kHz FS1, 96kHz FS2, 44.1kHz FS1, 88.2kHz FS2 or something else (white).

When a GNSS antenna is connected and receives a signal, the LED will show Receive. Otherwise, it is off.



Each of the 3 Video Sync Generators (A, B, C) operates independently and has an LED. The five standards are 1080i trilevel, 1080p trilevel, 720p trilevel, 625i bilevel and 525i bilevel. Hold Shift to see if the frame rate is 50fps, 24fps, 60fps, 59.94fps or something else (white).

The 4 Clock Generators (A, B, C, D) have the following modes: Word Clock FS1/2/4, AES DARS x1/x2, Super FS256 or 10MHz. Hold Shift to see if the sample rate is 48kHz FS1, 96kHz FS2, 44.1kHz FS1, 88.2kHz FS2 or something else (white).

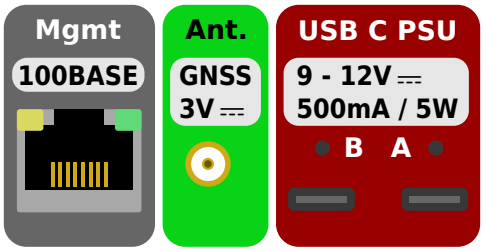


The front panel **LTC Out**put transmits balanced linear timecode. This timecode carries time-of-day (TOD), see Section 4.3.

The front panel also offers access to video Sync Outputs A and B and Clock Outputs A and B on BNC connectors. See Section 4 for details.

1.2. Rear Panel

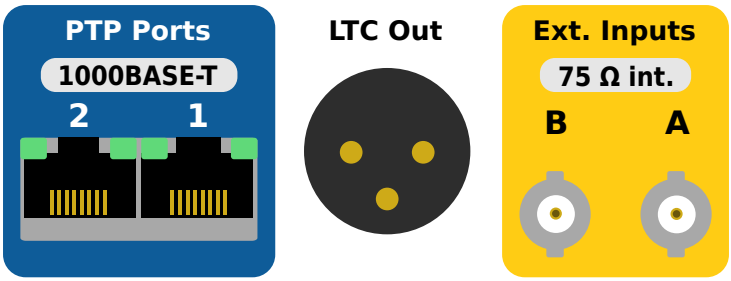
From right to left:



A USB power supply which can supply 9-12 Volts must be connected to USB C PSU A or B to power the unit. Regular Power delivery (PD) or Quick Charge (QC2.0) chargers can be used (also known as fast chargers). A and B are redundant, so if both are connected and one fails, the unit will continue operating without an interruption.

The SMA connector Ant. GNSS connects to a regular GNSS active antenna (not included). The antenna should be able to receive the standard L1 band at 1575.42 MHz. We achieved good results with off-the-shelf active patch antennas in puck-style housing. nanosyncs supplies it with 3.3VDC phantom power.

Mgmt 100BASE is the out-of-band (OOB) management Ethernet port. It supports full-duplex 100BASE-TX (Fast Ethernet) and is physically and logically separated from the other network interfaces. See Section 2.1.



Ext. Inputs A and B each accept any standard Video or Word Clock signal on BNC connectors. They are internally terminated with 75 Ω. See Section 3.3.

The rear panel **LTC Out**put transmits balanced linear timecode. This timecode carries time-of-day (TOD), see Section 4.3.

PTP Ports 1 and 2 support full-duplex 1000BASE-T (Gigabit Ethernet). This speed allows for fast and precise timing packets and these ports cannot establish a link with 10/100MBit or half-duplex link partners. Supported protocols include PTPv2, PTPv1 and NTPv4. See Section 2.2.



On the rear panel there are 6 Video Sync BNC connectors. 3 connectors output the standard configured for Generator A, 1 for B, 2 for C. See Section 4.1 for details.

6 Word Clock BNC connectors are on the far left side. 3 connectors for Clock A and 1 connector each for B, C, D. See Section 4.2 for details.

2. Network Interfaces

Table 1 lists the addresses and supported protocols of the three network interfaces.

	Mgmt	Port 1	Port 2
Physical layer	100BASE-TX full duplex	1000BASE-T full duplex	
Data link layer	Ethernet II, ARP		
MAC Address	see front panel	<Mgmt> +1	<Mgmt> +2
Internet layer	IPv4, ICMP, IGMPv3		
Default IP Addr.	dynamic	192.168.0.31	192.168.0.32
Transport layer	UDP, TCP	UDP	
Application layer	HTTP, DHCP, mDNS, DNS-SD, SNMPv2c	PTPv2, PTPv1, NTPv4	

Table 1: Network interfaces

2.1. OOB Management Port

The purpose of this port is to control, monitor and update the unit. Refer to Quick Start on how to assign an IPv4 address and open the web interface. The port also supports SNMP v2c. Currently this exposes ~50 read-only objects for monitoring. Download the latest MIB for all Rosendahl products at https://rosendahl-studiotechnik.com/ROSENDAHL-MIB.mib

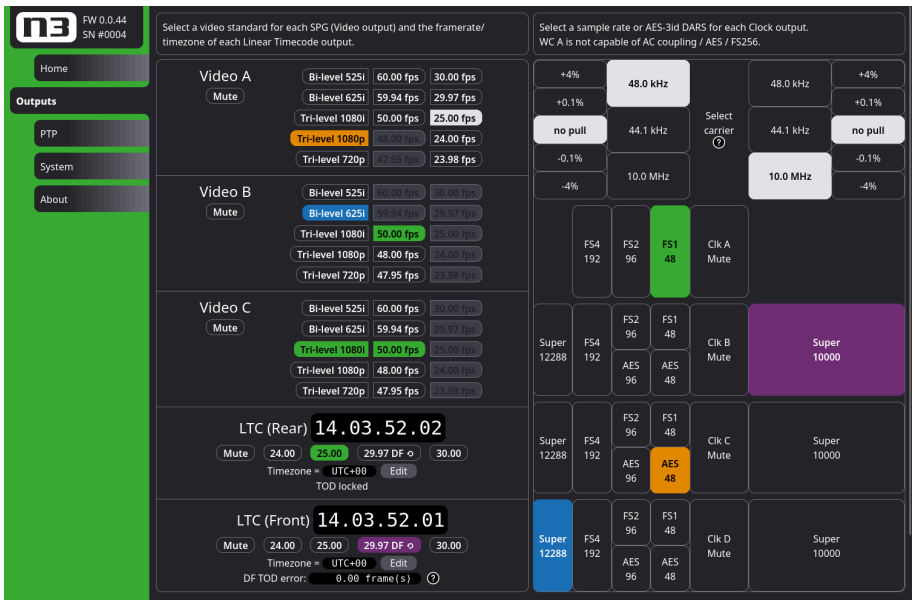


Figure 1: Screenshot of HTTP web interface

2.1.1. Firmware update

Recovery mode is used to update the firmware over HTTP. The unit will also enter recovery mode if the installed firmware is corrupt or incomplete.

Download the latest firmware from:
https://rosendahl-studiotechnik.com/downloads/
To enter recovery, either use the web interface System page or hold Shift during startup. While recovery is active, the front panel PSU Green light is alternating between A/B/A/B/A.. and so on. Please note: In recovery most features are unavailable, including the RGB LED front panel indicators and other network interfaces.

However, all Mgmt features from Table 1 are available. Recovery can be reached under the same IPv4 address. If needed, you can assign a static one using the same USB procedure as described in Quick Start. In this case, sucess is indicated by both PSU LEDs flashing together because RGB LED is unavailable.

When the web interface is accessed in recovery, you will be able to upload a .n3f firmware file directly from the browser or exit recovery.

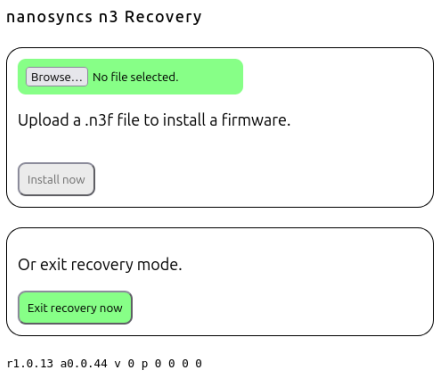


Figure 2: Screenshot of recovery interface

2.1.2. API message protocol

For automation and integration with other tools, the Management Port also implements a binary TLV message protocol on TCP transport.

Before this protocol can be used, it must be enabled in the System web page. The default TCP Port is 8050.

The API guide can be found at: https://nanosyncs.com/api

2.2. PTP Ports 1 & 2

These synchronization ports implement the PTP and NTP protocols.

2.2.1. IPv4 address

Before connecting a cable, access the Mgmt web interface as described in Quick Start. Then assign static IP addresses to the other 2 ports on the PTP page, where all PTP settings can also be found.

2.2.2. PTP synchronization

The Precision Time Protocol (PTP / IEEE 1588™) is a standard for precise synchronization of network clocks. n3 implements two Instances, one for Version 2 (1588™-2019) and one for Version 1 (1588™-2002). Version 1 is a legacy standard, however some media networks still make use of it.

The PTP Best Master Clock Algorithm (BMCA) automatically determines the Grandmaster of a PTP domain, i.e. the root Instance which other Instances follow. It is the user's responsibility to configure BMCA settings according to the intended structure:

- If the unit's Reference is Internal, GNSS or External, n3 should be chosen as Grandmaster to provide the network with this Reference.
- If the unit's Reference is PTPv2 Follower, n3 should be a Version 2 Boundary Clock. Another Instance is Version 2 Grandmaster.
- If the unit's Reference is PTPv1 Follower, n3 should be a Version 1 Boundary Clock. Another Instance is Version 1 Grandmaster.

Otherwise, the unit will still function but is decoupled from the network time. Example: Reference = GNSS and another Instance is Grandmaster. The time offset to this Grandmaster is still calculated and displayed, but ignored by n3.

Version 2 and 1 are treated independently. For this reason, n3 can be used as a "bridge" to synchronise domains of different Versions (In this case we would recommend using n3 as a Version 1 Grandmaster and Version 2 Boundary Clock on Reference PTPv2 Follower).

2.2.3. NTP server

The Network Time Protocol is a standard for network synchronization. n3 implements a Version 4 server.

3. Sync References

The Reference is the time source for the entire unit. One out of 5 options can be chosen: Internal, GNSS, External, PTPv2 Follower or PTPv1 Follower.

3.1. Internal

The unit contains a low-drift Temperature-Compensated Crystal Oscillator (TCXO) that has been factory calibrated. This is the default Reference and no external devices are required to use it.

You can recalibrate this oscillator when n3 is locked to another Reference, for example GNSS. The factory value is then overwritten.

3.2. GNSS

The built-in GNSS receiver can provide precise time and date. It requires an active Antenna positioned for decent reception and connected to the SMA connector on the back of the unit.

3.3. External A, B

Use any HD trilevel or SD bi-level video sync, Audio WC FS1/2/4/256 or 10MHz as a Reference. A has priority and is used if both A and B carry a valid signal. B would then only act as a fallback in case A is lost.

While this does not provide time or date information, n3 will always phase-lock the entire system (outputs, clock, PTP followers, NTP clients) to the nearest multiple of the External standard. Example: connect a Reference 720p 50fps and the unit will adjust to match these frames with an UTC of .02 seconds, .04 seconds and so on.

This also applies to any pull-down Video or pull-% Word Clock input.

3.4. PTP Follower

If the BMCA chooses a Grandmaster Instance which is not n3 (see Section 2.2.2), n3 will be a Boundary Clock and this Reference should be used. The Grandmaster is used as Reference and provides precise time and date.

4. Output Signal Generators

All generators are phase-locked to each other and the Reference. For this reason, multiple n3 in the same PTP domain or with GNSS always generate output signals with identical timing.

4.1. Video Sync

Framerate	23.98	24	25	29.97	30	47.95	48	50	59.94	60
1080i						✓	✓	✓	✓	✓
1080p	✓	✓	✓	✓	✓			✓	✓	✓
720p	✓	✓	✓	✓	✓			✓	✓	✓
625i						✓	✓	✓		
525i									✓	✓

Table 2: Supported formats

	Sync A	Sync B	Sync C
Number of BNC connectors	4	2	2

Table 3: Video Sync generators

Each of the 8 Video Sync BNC connectors is individually buffered to drive single-ended 75 Ω inputs at 300mV for bilevel or ±300mV for trilevel. Four connectors output the standard configured for Generator A, two for B, two for C.

4.2. Clocks

	WC A	WC B	WC C	WC D
Number of BNC connectors	4	2	1	1
WC FS1/2/4 @ 3.5Vpp	✓	✓	✓	✓
FS256 / AES-3id / 10MHz @ 1.0Vpp		✓	✓	✓

Table 4: Clock outputs

2 low-jitter DDS synthesizers are independently configured for 48kHz (pull ±0.1/4%), 44.1kHz (pull ±0.1/4%) or 10MHz. Each of the 4 outputs (ABCD) is individually configured to output a signal based on one of the synthesizers.

Each of the 8 Clock BNC connectors is individually buffered to drive single-ended 75 Ω inputs at 3.5 Vpp for DC coupling or 1 Vpp for AC coupling.

AC coupling is used for 10MHz, AES-3id DARS and FS256 (digidesign super clock). Output A is on 4 connectors and only capable of DC coupling. Outputs B, C and D (2+1+1 connectors) are capable of any mode.

4.3. Linear Timecode

	LTC Front	LTC Rear
Number of XLR connectors	1	1
24 fps	✓	✓
25 fps	✓	✓
29.97 fps DF	✓	✓
30 fps	✓	✓

Table 5: LTC outputs

The 2 SMPTE LTC generators on XLR connectors generate Time-of-day (TOD) timecode, for a specific timezone or UTC. The framerate and timezone are independently configurable for both.

5. Detailed Specifications

Video sync output	3 Generators (SPG) on 4+2+2=8 BNC, 75 Ω, Epoch aligned tri-level ±300mV 1080i47.95 1080i48 1080i50 1080i59.94 1080i60 1080p23.98 1080p24 1080p25 1080p29.97 1080p30 1080p50 1080p59.94 1080p60 720p23.98 720p24 720p25 720p29.97 720p30 720p50 720p59.94 720p60 bi-level 300mV 625i47.95 625i48 625i50 525i59.94 525i60
Clock synthesizers	2 Synths, 44.1 or 48kHz ±0.1%/4% pull or 10MHz, Epoch aligned 4 Derived outputs: “A”: FS1/2/4 “B,C,D”: FS1/2/4 / AES-3id x1/x2 / FS256 super clock or 10MHz 4+2+1+1=8 BNC, 75 Ω, 3.5Vpp (DC) 1.0Vpp (AC) Jitter of <8 ps RMS @20 Hz to 20 kHz
Time code output	2 SMPTE LTC on XLR, balanced, 3Vpp 24 / 25 / 30 / 29.97DF fps Time-of-day with Timezone
Network Sync	2 ports RJ45, 1000BASE-T full duplex, Ethernet II, ARP, IPv4, ICMP, IGMPv3, UDP, NTPv4 server, PTPv2 (IEEE 1588™-2019), gPTP (IEEE 802.1AS™), PTPv1 (IEEE 1588™-2002). Delay_Req: Unlimited followers, Hybrid mode supported (unicast request) Presets: AES67, ST 2110, Dante®, gPTP AVB
OOB Interface	1 port RJ45 out-of-band, 100BASE-TX full duplex, Ethernet II, ARP, IPv4, ICMP, IGMPv3, UDP, TCP, HTTP, DHCP, mDNS, DNS-SD, SNMPv2c
External input	2 BNC, 75 Ω internal termination, accepts SD bi-level syncs, HD tri-level syncs, 10MHz, 44.1 or 48kHz FS1/2/4/256 ±0.1%/4% pull, Epoch aligned
GNSS receiver	External active antenna required, SMA connector, 3.3VDC phantom power Timepulse 8ns capture and Epoch conversion Systems: GPS, QZSS, Galileo, GLONASS, BeiDou Signals: L1C/A (1575.42 MHz), E1-B/C (1575.42 MHz), L1OF (1602 MHz + k*562.5 kHz), B1I (1561.098 MHz), B1C (1575.42 MHz)
Internal timebase	TCXO, factory calibrated to GNSS, ±0.3ppm vs Ambient temperature 10 to 35°C
USB Host	Type A female, supports MSC mass storage devices FAT32 formatted
Power supply	2 redundant USB-C female with locking screw, 9 to 12VDC Power draw typ. 3W max. 5W Power Delivery (PD) sink requesting 9V or 12V, 0.5A Quick Charge 2.0 (QC) sink requesting 12V Grounding using chassis or rear M3 grounding screw
Dimensions	19″ 1U rack mount, 403 x 102 mm, 1.2kg

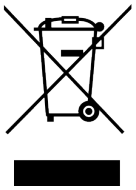
Support and information

support@nanosyncs.com
Rosendahl Studiotechnik GmbH
Andechser Str. 5
86919 Utting
Germany

Download newest software and documentation:
https://rosendahl-studiotechnik.com/downloads/

6. Revision History

Manual revision	Date	Changes
3-3-b	10/2026	Added API chapter
3-3-a	10/2026	Initial release



This product is a B2B category product. It should not be disposed with other household wastes at the end of its working life. To prevent possible harm to the environment or human health from uncontrolled waste disposal, please separate this from other types of wastes and recycle it responsibly to promote the sustainable reuse of material resources.

This product should not be mixed with other commercial wastes for disposal. Business users should contact their supplier and check the terms and conditions of the purchase contract. For WEEE compliant disposal, it may be returned to the manufacturer Rosendahl Studiotechnik GmbH, Andechser Str. 5, 86919 Utting, Germany.

Declaration of Conformity

CE

Rosendahl Studiotechnik GmbH
Andechser Str. 5
86919 Utting a.A.
Germany
herewith confirms that the product:
nanosyncs n3
is in conformity with the following directives and standards:

Directive 2014/53/EU (RED)
ETSI EN 303 413 V1.2.1

Directive 2014/35/EU (Low Voltage)
EN 62368-1

Directive 2014/30/EU (EMC)
ETSI EN 301 489-1 V2.2.3
ETSI EN 301 489-19 V2.2.1
DIN EN IEC 61000
DIN EN 55032 (Class A)
DIN EN 55035

Directive 2011/65/EU 2015/863/EU (RoHS)
DIN EN IEC 63000