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CurveX 3 Nano®

Article number: CX3040

User Guide

V1.1- 0916

Warranty

TQC will grant a warranty for a period of 12 months for TQC CurveX 3 Nano and 12 months for all related equipment from the date of delivery in respect of any evidence of faulty workmanship and materials. TQC will extend the warranty for TQC CurveX 3 Nano to a period of 24 months from the date of delivery if TQC CurveX 3 Nano is licensed via the TQC Ideal Finish Analysis software. Should a delivered consignment prove to be contrary to contract upon inspection, the customer shall grant TQC the opportunity hereunder of removing the fault, or else the customer may demand a replacement. Should the supply or delivery of any improvement or replacement not prove possible, the customer may choose between having the purchase price reduced or in demanding the contract of sale to be rescinded (conversion). Damage resulting from natural wear and tear, mechanical or chemical damage, an act of God or non-compliance with the operating instructions shall be excluded from the warranty as well as mechanical interference by the customer or by third parties with TQC CurveX 3 Nano and related equipment without TQC's written permission. No liability will be accepted for defects, damage or injury caused due to use not carried out in accordance with the manufacturer's user instructions.
To claim warranty, the rejected product has to be sent to TQC together with the original invoice, any exchange before the product has been returned to TQC is not possible. TQC reserve the right to repair, exchange or supply an equivalent substitute. TQC is not liable for handling or transport costs. Warranty on the purchase price is limited, all liability for consequential damages or changes in technology is expelled.

CE This product meets the IEC 61326-1 Electrical equipment for measurement, control and laboratory use – EMC requirements.

This product is RoHS2 compliant (2011/65/EU).

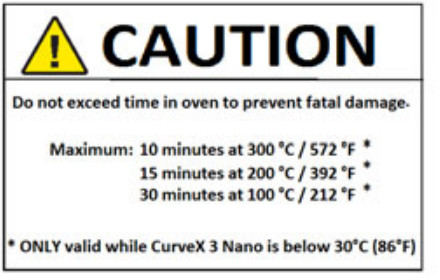


Table of Contents

1. Getting started with the TQC CurveX 3 Nano

The CurveX 3 Nano is an intelligent temperature data logging system that is specially designed for can coaters. This manual describes how to use the CurveX 3 Nano logger and how to download the measurements to your computer with the Ideal Finish Analysis software. For the software installation instructions we kindly refer you to the software manual.

1.1 Quick start

The information in the following steps should be sufficient to allow you to operate the CurveX 3 Nano without further use of this manual. For more detailed information we refer you to the remainder of the manual. See Figure 1 for more information about the interface positions.

Step 1. Set the paint type and other parameters of the CurveX 3 Nano with the Ideal Finish Analysis software on your PC:

- Connect the CurveX 3 Nano with your PC using the USB data cable.
- Choose **User settings** in the **Logger** menu and follow the wizard.
- Disconnect the logger from the computer

Step 2. Choose your end cap

For outside can coating

For inside can coating

Step 3. Connect the temperature probes to the input points (position 7) of the CurveX 3 Nano. Guide the sensor wires through the cable outlet. Place the end-cap and secure it by tightening the lock screw.

Step 4. Press the POWER button (position 1) for one second to switch on the CurveX 3 Nano.

Step 5. Start the recording process by pressing the START button (position 2). All 3 LED's (position 4, 5 and 6) will blink once.

The logging led will blink blue at the specified logging interval.

Step 6. Place the other end-cap and secure it by tightening the lock screw.

Step 7. Mount the CurveX 3 Nano logger onto the oven chain pins.

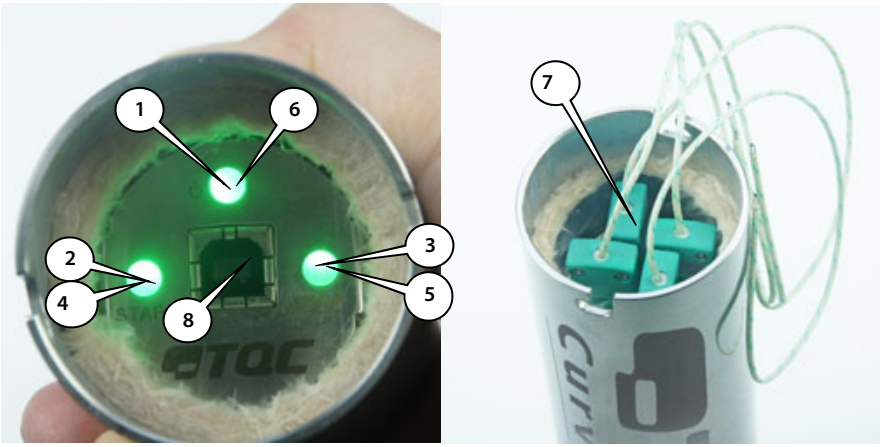
Step 8. Send the system through the oven and then remove the instrument as soon as possible. The paint led (position 5) blinks green after a full cure or red after a partial cure.

Step 9. Stop the recording process by pressing the STOP button (position 3).

Step 10. Download the results with Ideal Finish Analysis:

- Choose '**Download all data to PC'…**in the **Logger** menu of Ideal Finish Analysis and follow the wizard.

Figure 1



1.	POWER button	Press one second to power on
2.	START button	Press to start logging
3.	STOP button	Press to stop logging
4.	Paint LED	**Red** partial cure, **Blue** active, **Green** full cure
5.	Logging LED	**Green** LED indicates CurveX 3 Nano is logging
6.	Battery LED	Shows battery status when powered on: **Red**<25%, **Blue** 25% to 75%, **Green**> 75%
7.	Thermocouple connectors 1 - 4	Connect up to four probes
8.	USB type B port	Connect USB cable to charge and/or download data

1.2 Memory- batches

The memory of the CurveX 3 Nano can store a total of 160,000 readings. The memory is divided into 10 memory blocks of 16,000 readings each.

For each new batch, the CurveX 3 Nano will always start at the beginning of the next memory block, even if the previous block was only partly used. Loggings that take longer than 16,000 readings are stopped at reading number 16,000. The maximum number of batches that can be stored is 10.

1.3 CurveX 3 Nano tasks

This table below describes the most frequently performed tasks:

Task	Action on logger	Ideal Finish software menu	Option
Power on	Press POWER button		
START logging	Press START button		
STOP logging	Press STOP button		
Power off	Press POWER button		
Download data		Logger	Download all data to PC
Change settings		Logger	User settings

2. Downloading data and configuring the CurveX 3 Nano

The CurveX 3 Nano is a logger without a display. You will have to use Ideal Finish Analysis to download data and change the settings of the logger. The license key and memory stick with the Ideal Finish Analysis software are part of the CurveX 3 Nano package. For the installation of the software you are referred to the software manual. To obtain your CurveX 3 Nano license key you are referred to the Ideal Finish Analysis Quick Start Manual.

After the installation of the software you can connect the logger to your computer and access the **Logger** menu where the following options are available. For information about installing the software and connecting the logger you are referred to the software manual.

Step 1. Power on the data logger by pressing the POWER button (see figure 1, position 1) and start the Ideal Finish Analysis software.

Step 2. Connect the USB connector to the CurveX 3 Nano (see figure 1, position 8).

Step 3. Connect the other side of the USB cable to the PC.

Step 4. Choose Logger from the menu. The following options are available:

- *Download all data to PC*
- *Download Express*
- *Real Time…*
- *User settings*
- *Configure & test*

2.1 Logger menu — Download all data to PC…

After selecting this menu option a wizard appears where you can:

- Set the download folder.
- Select a template in which the settings of the oven, the probe layout and the paint type are defined.
- Select the batches to be downloaded.

2.2 Logger menu — Download Express

Ideal Finish Analysis can speed up the printing of a report at the click of a single button. Switch TQC Ideal Finish Analysis to advanced mode to enable your line operators to print a report based on a template for specific processes.

2.3 Logger menu — Real Time…

Use this option to view and analyze data the moment they are measured.

2.4 Logger menu — User Settings…

Use this option to specify the following settings in Ideal Finish Analysis.

- Select the logging interval time
- Specifying the time
  - Check the Synchronize check box. This will set the data logger time to the PC time
- Setup the batch names
  - Double click on the current name to enter a new batch name
- Set the paint types in your logger
- Set the cure specifications for the report
- Configure the properties when logging data in Real Time.
  - Enter a description of the object you are measuring and enter a description of the location where the measuring takes place.

2.5 Logger menu — Configure & Test…

In order for the data logger to communicate with a computer, use the USB cable to connect it to an available port on the computer. Once connected, communication can be tested by taking the following steps:

Step 1. Connect the data logger to the computer using the cable that comes with the logger.

Step 2. Choose Configure & Test…[1] from the Logger menu.

Step 3. The logger starts measuring automatically, displaying the measurements[2] in a pop-up window.

Step 4. Click More to see information about the connected logger, click OK or Cancel to close the pop-up window.

[1] If an error message is displayed, switch to another USB port. If all ports display an error message, make sure that the rechargeable battery is charged and the data logger is powered on.

[2] Measurements will be shown even when no probes are connected. This is normal behavior and are the internal cold junction temperature measurements.

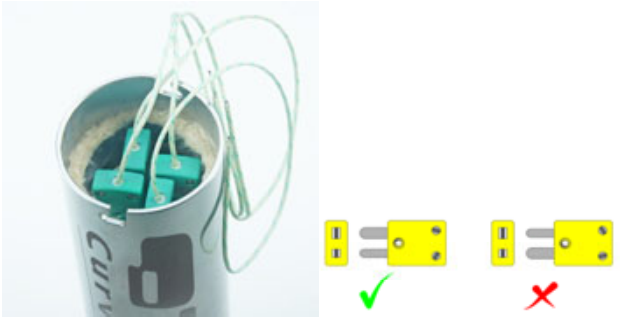
3. The CurveX 3 Nano thermocouple connectors

The CurveX 3 Nano is equipped with four thermocouple (K-type) connectors. The connectors are numbered 1 to 4. See the front of the data logger.

3.1.1 Connecting the probes

To measure the ambient temperature and the temperature of a product up to four probes can be connected to the connectors. The logger automatically detects the connected probes. To ensure accurate measurements, use only the K type sensors (+: NiCr / -: NiAl). The pins on a thermocouple plug are of different widths and can only be plugged in one way. See figure 2 Common probes as clamp, ring-type, and wire probes can be used but also special infrared probes.

Figure 2.



The position of the sensors on the object can be stored in Ideal Finish Analysis. The position will then also be available in the reports.

Remark: Make sure that the probe cables are free from objects and the oven walls, floor, sealing and burners, etc. to prevent them from snagging, as this may cause serious damage to the probe and the instrument. Also check whether the probes have been placed securely so that they do not fall off during the process.

Precautions:
Use heat protective gloves when removing the sensors. Remove the probes carefully; do not pull the cables.

To prevent tears in the cable sheath and broken cores, do not wind the probe wires too tightly.

Closing the CurveX 3 Nano

Put the CurveX 3 Nano end-caps in place and secure it by tightening the lock screw with the supplied Allan key/hex wrench.

The wire probes

This universal probes can be used for either air or surface temperature measurements. The measuring element is an open thermocouple that can be attached with adhesive tape or by other mechanical means.

Optional: The clamp surface probe

Use the clamp to place this probe on any object. The sensor element is located inside the jaw of the clamp, insulated by a small piece of ceramic. There is some friction on this part in order to align the sensor element with the surface to ensure good contact.

- Take the clamp between your thumb and forefinger. Check which jaw has the sensor element and place the probe at the preferred location on the object. The maximum reach of the clamp is 20mm.

Optional: The clamp air probe

This fast-responding probe has its sensor element inside the small steel protective tube.

- Connect the probe to the object or conveyor belt in the same way as specified for the clamp surface probe.

4. CurveX 3 Nano protection

The data logger itself may not exceed a temperature of 60°C (140°F). Since the logger is used inside high-temperature curing ovens, the CurveX 3 Nano uses latest insulation materials to protect it. The CurveX 3 Nano thermal barrier protects the data logger from the high outside temperatures.

N.B. Prior to run any oven temperature recording, it is very important that the CurveX 3 Nano is below 30 °C (86 °F) before the system is sent through the oven.

4.1.1 Preparing for measurement

Step 1. Make sure the CurveX 3 Nano is sufficiently cooled down.

Step 2. Start the logger.

Step 3. Mount the CurveX 3 Nano end-caps and secure them by tightening the lock screws with the supplied Allan key/hex wrench.

Step 4. Firmly attach the wire probes to the points of measurement with self-adhesive attachment pads/tape or by other mechanical means.

The system is now ready to be sent through the oven.

4.1.2 Handling precautions

Since the heating process inside the box is not stopped instantly after the box has left the oven, we strongly advise you to take the following precautions:

- Always wear heat protective gloves when handling the box and the probes after a run because the box will be hot after a measurement.
- Open the box as soon as possible after the test in the oven.
- Take the logger and bracket / heat absorber out of the box so that they can cool down. Note that the heat absorber needs quite a long time to cool down once it gets hot.
- When storing the box, do not lock the cover with the latches. This will extend the life span and preserve the elasticity of the rubber gasket!

4.1.3 Precautions - Batteries in carry-on baggage (aircraft cabin)

The battery employed in our CurveX 3 Nano is a generic single cell Lithium-Ion battery, 3.7V 800mAh. The battery employed in the CurveX 3 Nano has a capacity of 2.96 Watt-hours, and is rated for low-power use only. A protection circuitry has been applied to the CurveX 3 Nano mainboard as per best practice.

Based on US DOT regulations (49 CFR, Sec. 175.10), the CurveX 3 Nano battery satisfies all demands, most notably:

- The battery is non-replaceable for the end user and therefore does not classify as 'spare'
- The battery is rated below 100 Watt-hours per battery
- The battery is protected from damage and short circuit

The battery is assembled into an end product and classified to be freely transported on aircraft both in carry-on and check-in luggage. When carried-on, please keep the provided product documentation with the device in order to be able to provide regulatory agencies relevant information about your device when requested.

5. Specifications TQC CurveX 3 Nano

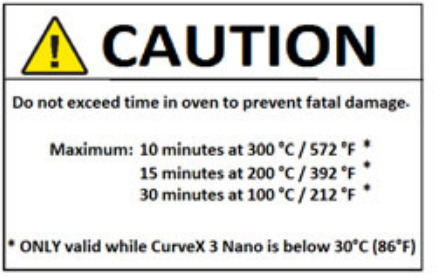
CurveX 3 Nano logger	
Measuring range	0°C to 300°C / 32°F to 572°F
Operating temperature	0°C to 60°C / 32°F to 140°F
Maximum time in oven	10 minutes at 300 °C / 10 minutes at 572 °F
	12 minutes at 250 °C / 10 minutes at 482 °F
	15 minutes at 200 °C / 10 minutes at 392 °F
	19 minutes at 150 °C / 10 minutes at 302 °F
	30 minutes at 100 °C / 10 minutes at 212 °F
Accuracy	±1°C / 1.8°F
Channels	4
Sample interval time	1s to 60 min
Memory	10 batches with 16000, or 1 batch with 160000 readings
Display	Three multi-colour LED's
Interface	USB
Housing material	Stainless Steel
Dimensions (D x W x H) Incl. End caps with guide slots	51x210x110 mm / 2.00 x8.27 x4.33 inch
Dimensions (D x W x H) Incl. End caps	51 x 210 mm / 2.00 x 8.27 inch
Power supply	Rechargeable battery
Battery life time	120 hour continuous use
Weight	850 g / 30 oz.
TQC Ideal Finish Analysis software	
Supported Operating Systems	Windows Vista, Windows 7 and Windows 8 / 8.1
Platform	32bit or 64bit
Memory	32MB
Required Hard Disk space	128 MB

5.1 CurveX 3 Nano package

The TQC CurveX 3 Nano comes with the following items:

- CX3040 CurveX 3 Nano
- CL0018 Factory calibrated, calibration certificate included
- CX5010 Ideal Finish Analysis license key
- CM1105 USB data cable
- GL0103 USB memory stick with software
- DI0611 Plastic carrying case
- CX9090 4x Wire probe
- CX2205 Set of self-adhesive attachment pads (T=250°C/482°F)


WARNING
Hot surface.
Wear protective gloves.
Read and understand operator's manual before operating equipment.


CAUTION
Do not exceed time in oven to prevent fatal damage.
Maximum: 10 minutes at 300 °C / 572 °F *
15 minutes at 200 °C / 392 °F *
30 minutes at 100 °C / 212 °F *
* ONLY valid while CurveX 3 Nano is below 30°C (86°F)

TQC

Vision on quality
www.tqc.eu

Developers and manufacturers of paint test equipment

Vision on quality
www.tqc.eu

TQC B.V.

Molenbaan 19
2908 LL Capelle aan den IJssel
The Netherlands

T +31(0)10 - 79 00 100
F +31(0)10 - 79 00 129
E info@tqc.eu
W www.tqc.eu

TQC UK

Po Box 977A
Surbiton, KT1 9XL - England

T +44 208 255 0143
E janet@tqc.eu
W www.tqc.eu

TQC GmbH

Nikolaus-Otto-Strasse 2
D-40721 Hilden - Germany

T +49 (0)2103-25326-0
F +49 (0)2103-25326-29
E info.de@tqc.eu
W www.tqc.eu

TQC-USA Inc.

4053 S. Lapeer Road - Suite H
Metamora, MI. 48455 - USA

T +1 810 678 2400
F +1 810 678 2422
E joel@tqc-usa.com
W www.tqc-usa.com

TQC ITALIA S.R.L.

Via Cesare Cantu'26
20831 Seregno (MB) - ITALY

T +39 0362 1822230
F +39 0362 1822234
E info@tqcitaly.it
W www.tqc.eu

TQC Norge AS

Øvre Langgate 26
3110 Tønsberg - Norway

T +47 33310220
F +47 33310221
E info@tqc.eu
W www.tqc.eu