

CurveX4

CX4005, CX4010

Operating Instructions (v1.0 0522)



IMPORTANT! Before taking this instrument in use we strongly advise you to read this manual carefully.

WARRANTY

Industrial Physics will grant a warranty for a period of 12 months for CurveX 4 and 12 months for all related equipment from the date of delivery in respect of any evidence of faulty workmanship and materials. Should a delivered consignment prove to be contrary to contract upon inspection, the customer shall grant Industrial Physics 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possible, the customer may choose between having the purchase price reduced or in demanding the contract of sale to be rescinded (conversion).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 CurveX 4 and related equipment without Industrial Physics' 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 Industrial Physics together with the original invoice, any exchange before the product has been returned to Industrial Physics is not possible. Industrial Physics reserve the right to repair, exchange or supply an equivalent substitute. Industrial Physics 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.



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

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1 GENERAL

1.1 Importance of operating manual

This manual is written in order to become familiar with all the functions and possible applications of the instrument. It contains important instructions about how to use the instrument safely and economically; according to the purpose designated. Following these instructions is not only essential to avoid risks. It also reduces repair costs and down-time and increases the products reliability and service-life.

Anyone who works with the instrument shall follow the instructions in this manual, particularly the safety related instructions. Additionally local rules and regulations relating to environmental safety and accident prevention should be observed. It is mandatory that users have read and understand this manual prior to first operation of the Automatic Film Applicator Compact.

1.2 User-responsibility

The user should

- a) Only allow persons to work with the instrument who are familiar with the general instructions on how to work safely and to prevent accidents. The use of the instrument should have been instructed duly. The safety chapter and the warnings in this manual should have been read and understood; acknowledged as evidenced by their signature.
- b) Regularly check the safety-awareness of personnel at work.

1.3 Responsibility of personnel

Before commencing work anyone appointed to work with the instrument should pay attention to the general regulations relating to working safety and accident prevention. The safety chapter and the warnings in this manual should have been read and understood; acknowledged as evidenced by their signature.

1.4 Dangers

This instrument has been designed and constructed in accordance with state-of-the-art technology and the acknowledged safety regulations.

Nevertheless, working with the instrument may cause danger to the life and health of the operator or to others, or damage to the instrument or other property. Therefore the instrument should only be used for its designated purpose, and in a perfect technical condition. Any defect that could have a negative effect on safety should be repaired and recorded.

1.5 Designated purpose

The Automatic Film Applicator Compact is exclusively designed to apply thin films of liquid or pastes on test specimen. Other applications constitute improper use. TQC Sheen will not be held liable for damage resulting from improper use.

Designated purpose also includes properly observing all instructions in the operation manual, and adherence to inspection and maintenance schedules. TQC Sheen is entitled to request these form when warranty claims are made and during inspections to ensure safe operation and evaluate correct usage.

1.6 Copyright

The copyright of this operating manual remains with TQC Sheen. This operating manual is intended solely for the user and his personnel. Its instructions and guidelines may not be duplicated, circulated or otherwise passed on to others, neither fully, nor partly. Infringement of these restrictions may lead to legal action may be taken if these restrictions are infringed upon.

1.7 Manufacturer's/Supplier's address

TQC Sheen | Industrial Physics
Molenbaan 19
2908 LL Capelle aan den IJssel
The Netherlands
T +31(0)10 7900 100

2 SAFETY INSTRUCTIONS

2.1 Meaning of Symbols

The following symbols for dangers are used in this instruction manual.



Possible immediate danger to the life or health of personnel.

If this guideline is not noted it can lead to severe danger to health, up to fatal injury.



A dangerous situation could be caused.

Non observance of this guideline can lead to injury or to damage to equipment.



Special tips and particular information.

Guidelines to make optimal use of the instrument.

2.2 Availability of Safety Information

The instruction manual should be kept in proximity to where the instrument operates and should be visible and accessible at any time of operation.

In addition to the information contained in the instruction manual, general and local regulations for accident prevention and environmental protection shall be kept available and observed. Always ensure all guidelines in respect of safety and dangers on the instrument are in readable condition.

In case of danger the instrument has to be switched off by means of the on / off switch at the left back side of the instrument or by unplugging the mains power, then the danger should be eliminated.

2.3 Dangers from Electrical Energy

- Work on the electrical supply may only be done by a qualified electrician.
- The electrical equipment of the instrument must be checked regularly.
Loose connections and cables damaged by heat must be corrected immediately.
- Always make sure the instrument's power is turned off while adjusting any electrical component.



Make sure that no paint or other liquids are spilled on the electronics

2.4 Modifications to the Equipment

- Any modifications or additions or alterations to the instrument may solely be made with permission from the manufacturer otherwise the warranty will be void.
- Instruments which are not in fault-free condition must immediately be switched off
- Only use replacement parts from the original supplier. Parts used from other sources aren't guaranteed to take the loading and meet the safety requirements.

3 TRANSPORT AND STORAGE

3.1 Packing

- Please take note of pictorial symbols on the packing.

3.2 User: Check on Receipt

- Check packing for damage
- After unpacking check complete supply.

3.3 Reporting Transport Damage and Documentation

- Any damage should be documented as accurately as possible (possibly photographed) and reported to the relevant insurers or, in the case of sales “delivered to customers works”, to the supplier.

3.4 Storage and Protective Measures when not in use

- The instrument must be stored in a dry place at a temperature between 10 - 40°C.
- If packing is damaged upon receipt immediately inform the forwarder and make a note on the packing list and have it signed by the forwarder. Ideally make some pictures of the damage as well.
- Store instrument in the original packing if possible.

4 GETTING STARTED WITH THE TQC SHEEN CURVEX 4

The CurveX 4 is an intelligent temperature data logging system that was specially designed to control curing processes in the coating industry. This manual describes how to use the CurveX 4 logger and how to download the measurements to your computer with the Ideal Finish Analysis software. For the software installation instructions see the software manual.

4.1 Quick start

The information in the following steps should be sufficient to allow you to operate the CurveX 4 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 4 with the Ideal Finish Analysis software:

- Start Ideal Finish Analysis on the computer and connect the logger
- Choose User settings in the Logger menu and follow the wizard. See the Ideal Finish Analysis help for details on the options.
- Disconnect the logger from the computer

Step 2

Connect the thermocouple probes to the input points at position 7 of the CurveX 4.

Step 3.

Attach the sensors to the object to be measured.

Step 4.

Press and hold down the Power button (position 1) for one second to switch on the CurveX 4.

Step 5.

Start the recording process by pressing the START button (position 2). The logging, paint and battery leds (position 4, 5 and 6) will blink once. The logging LED will blink blue at the specified logging interval.

Step 6

Place the CurveX 4 logger inside the insulation box. Make sure the insulation system is set up properly, as specified in the manual of the insulation box chosen. The cables are guided through the cable outlet and the cover is closed securely, using the gasket to ensure optimal heat protection.

Step 7

Send the system through the oven and then remove the instrument from the box as soon as possible. The paint LED (position 5) blinks green after a full cure or red after a partial cure. The cure specification is set in the software, see the Ideal Finish Analysis help for more details (logger menu – user settings).

Step 8

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

Step 9

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
Front View and Top View of CurveX 4

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

*After 300 cycles charge from 0 to 100% the battery will retain a capacity of 80%. In general such battery need replacement after approx. 2 years continuous use.

4.2 Memory - batches

The memory of the CurveX 4 can store a total of 1.000.000 readings. The memory is divided into 20 memory blocks of 50.000 readings each.

For each new batch, the CurveX 4 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 50.000 readings are stopped at reading number 50.000. The maximum number of batches that can be stored is 20.

4.3 CurveX 4 tasks

This table below describes the most frequently performed tasks:

Task	Action on logger software menu	Ideal Finish	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

4.4. Downloading Data And Configuring The CurveX 4

The CurveX 4 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 4 package. For the installation of the software you are referred to the software manual. To obtain your CurveX 4 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 4 (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

4.5 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.

4.6 Logger menu — download express

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

4.7 Logger menu — Real Time...

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

4.8 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.

4.9 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 measurements² 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.

5 THE CURVEX 4 THERMOCOUPLE CONNECTORS

The CurveX 4 is equipped with eight thermocouple (K-type) connectors. The connectors are numbered 1 to 8. See the front of the data logger.

5.1 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.

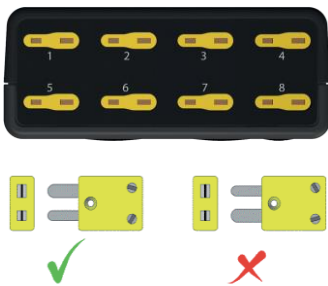


Figure 2
Thermocouple K Connector Usage

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:

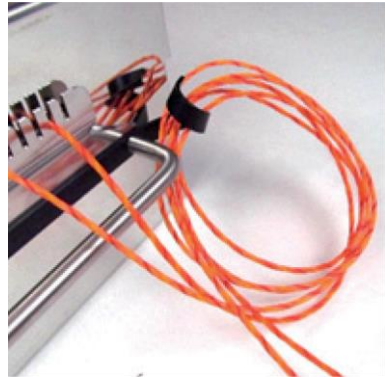
Make sure that the probe cables are free from objects and the oven walls, floor, sealing and burners, etc. to prevent them from snagging, as this may cause serious damage to the probe and the instrument. Also check whether the probes have been placed securely so that they do not fall off during the process.

Options:

When there is too much cable length you can connect the extended cable length to the gray loop on the side of the insulation box next to the grip.

Precautions:

Use heat protective gloves when removing the sensors. Remove the probes carefully; do not pull the cables. To prevent tears in the cables' sheath and broken cores, do not wind the probe wires too tightly.



The magnet surface probe

This probe can be placed on any ferrous steel object. The sensor element is located exactly in the middle of the probe.

- Take the probe between your thumb and forefinger at the metal cable support just above the magnet and place the probe at the preferred location on the object.



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.



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.



The wire probe

This universal probe 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.



6 CURVEX 4 PROTECTION - USING THE INSULATION BOX

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 4 thermal barrier system is used to protect it. The CurveX 4 thermal barrier box protects the data logger from the high outside temperatures.

Either a single bracket or a heat absorber can be used to increase the heat resistance. The heat absorber contains material that absorbs the energy that penetrates the box.

N.B. Prior to run any oven temperature recording, it is very important that both the insulation box and the heat absorber temperatures are below 20°C (68°F) before the system is sent through the oven. Always refer to the insulation box datasheet for the maximum time and temperature use.

6.1 Preparing for measurement

Step 1. Make sure the box is at room temperature.

Step 2. Place the CurveX 4 data logger, with the probes already connected, inside the box.

Step 3. lead the probe cables over the gasket and edge of the box at the cable outlet point.

Step 4. Start the logger.

Step 5. Mount the cover on the box and make sure the stainless steel edge slides a few millimeters over the box on all sides. Also check whether the cutout of the cable outlet of the cover is facing the same cutout in the box and whether the probe cables are positioned properly.

Step 6. Tighten the cover with the four latches and check again whether the box is properly closed on all sides.

The system is now ready to be sent through the oven. Use the grip to hang the box, if necessary.

The isolation box has a ferrous steel plate on top, which can be used for mounting the magnetic probes while transporting the set.



6.2 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

- 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!

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

The battery employed in our CurveX 4 is a standard set of 2 AA batteries. The batteries employed in the CurveX 4 may fall under restrictions in airline carry on policies. Commonly dry batteries like the AA, AAA,C and D batteries will not be subject to these restrictions.

Based on USDoT regulations (49 CFR, Sec. 175.10), the CurveX 4 battery satisfies all demands, most notably:

- The battery is a dry battery
- The battery is rated below 100 Watt-hours per battery
- The battery is protected from damage and short circuit

Based on the known airline regulations the batteries might need to be removed from the instrument during transport. Allowing the logger to be carried in carry-on and check-in luggage, the batteries might be only carry-on.

7 SPECIFICATIONS CURVEX 4

CurveX 4 logger

Measuring range	-100°C to 1200°C
Operational temperature:	0°C to 60°C
Accuracy	±1 °C / 1.8 °F
Channels	8
Sample interval time	1 s to 60 min
Memory	20 batches with 50.000 readings
Display	Three multi-colour LED's
Interface	USB -c
housing material	Anodised Aluminium / Plastic
Dimensions (D x W x h)	110 x 85 x 35 mm
Power supply	2 AA batteries (standard or rechargeable)
Battery life time*	35h with rechargeable batteries, 60 with alkaline batteries
Weight	205 g / 7.2 oz. (Excluding batteries)

Industrial Physics Ideal Finish Analysis software

Supported operating Systems	Windows vista, Windows 7 and Windows 8 / 8.1, Windows 10
Platform	32 b or 64 b
Memory	32 MB
required hard Disk space	128 MB

* After 300 cycles charge from 0 to 100% the battery will retain a capacity of 80%.
In general such battery need replacement after approx. 2 years continuous use.

7.1 CurveX 4 package (CX4005)

The CurveX 4 comes with the following items:

- CX4005 CurveX 4 Oven Logger
 - Ideal Finish Analysis Software
 - Rechargeable AA batteries
 - Factory calibrated, calibration certificate included (CL0018)
 - USB-C Cable (GL0400)
 - Plastic Carrying Case (CX3059)

- Silicone Seal (CX2071)
- Probe Identification Set (CX2100)
- Plastic Carrying Case (CX3060)
- Factory calibrated, calibration certificate (CL0018)

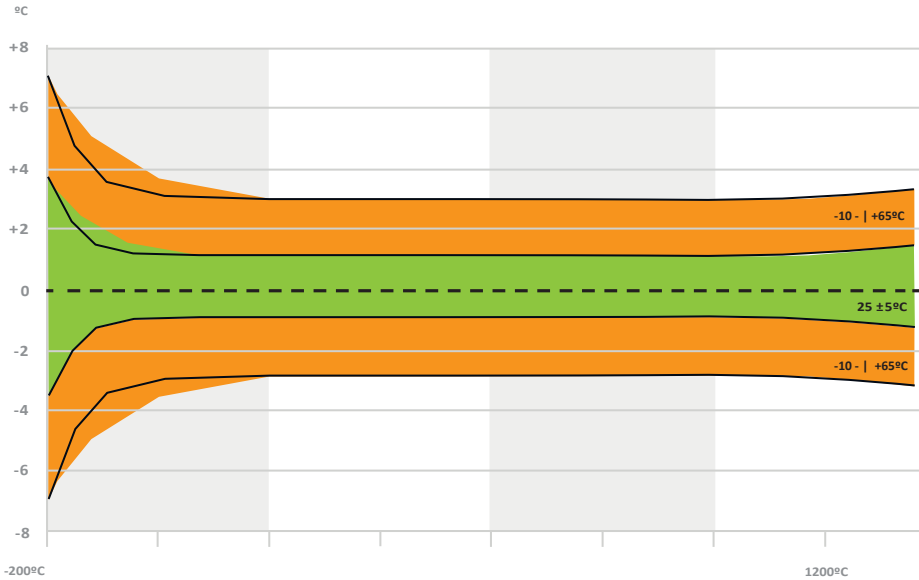
7.2 CurveX 4 kit (CX4010)

- CX4005 CurveX 4 Logger
 - Ideal Finish software
 - USB-C Cable (GL0400)
 - Insulation box 300°C (CX2005)
 - Energy Absorber (CX2011)

7.3 Accessories

- CX2005 CurveX insulation box (H=140 mm, T=300 °C / 572 °F)
- CX3050 Insulation Box Logger Bracket
- CX2011 CurveX heat-absorber
- CX2100 CurveX Basic probe identification kit (1-6)
- GL0400 USB-C Cable

7.4 CurveX4 Logger operation measurement



The above-stated graphic depicts the total maximum difference between loggers in the total population of the loggers. This graphic is thus an absolute worst-case scenario.

The green zone shows the worst-case performance at standard environmental conditions.

The orange part is its full-designed temperature use. Meaning the maximum deviation between 2 loggers measuring -200°C at an operational temperature of 65°C is 7°C . The daily performance of the loggers will be significantly better than the above stated.

6 DISCLAIMER

The right of technical modifications is reserved.

The information given in this manual is not intended to be exhaustive and any person using the product for any purpose other than that specifically recommended in this manual without first obtaining written confirmation from us as to the suitability of the product for the intended purpose does so at his own risk. Whilst we endeavor to ensure that all advice we give about the product (whether in this manual or otherwise) is correct we have no control over either the quality or condition of the product or the many factors affecting the use and application of the product. Therefore, unless we specifically agree in writing to do so, we do not accept any liability whatsoever or howsoever arising for the performance of the product or for any loss or damage (other than death or personal injury resulting from our negligence) arising out of the use of the product. The information contained in this manual is liable to modification from time to time in the light of experience and our policy of continuous product development.



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