OmniCure® PLC 2000 User Guide

Applicable for the following PLC UV Head Controller model:

Model	Part Numbers
PLC2000	019-00214R

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OmniCure®
UV Curing • In Control

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1   Introduction

The OmniCure® PLC2000 is a multipurpose external controller device for the OmniCure® AC series of UV LED curing systems. This innovative product accessory is specially designed to complement the high powered UV LED curing solutions by providing unparalleled control of output intensity, exposure time, and on/off capabilities while providing system information and error monitoring. By connecting an AC Series UV LED lamp via its PLC interface to the PLC2000, the system can be operated in two modes:

- Local operation – Where the user can adjust, control, and monitor features such as intensity level, exposure time and on/off capabilities through the PLC2000 device
- Remote operation - Where the system can be operated and monitored through an automated system via commands programmed from a PC or PLC

The OmniCure PLC2000 features a comprehensive display of UV LED curing system information with LED indicators updating critical details such as power on and initialization states, as well as the various modes of operation that are supported.   Temperature, operational hours, intensity control, and timer/pulse output modes can be easily accessed and modified to provide unmatched performance control.

Supporting RS232 and RS485 communications, the PLC2000 is a robust accessory for the OmniCure® AC series of products, and when paired with a system allows for multiple UV LED heads to be daisy-chained and accessed or controlled through a single computer terminal.

With quick set-up, easy integration, and intuitive features such as a door lock for safety assurance, the PLC2000 is a perfect accessory to complement the AC Series and provide a complete LED curing solution for your applications.

OmniCure® has combined next generation optical engineering, state-of-the art electronics and fibre-optics to produce sophisticated technologies that employ light. Today, OmniCure® is a leading developer of light-based systems for sectors ranging from manufacturing to bio-medicine, and is unmatched in commitment to quality and service.

This manual covers the following model:

PLC2000   019-00214R

Excelitas Technologies recommends reading this guide to discover all features of the OmniCure® PLC2000, and how to use them.

2 Safety Precautions/ User Warnings

2.1 Glossary of Symbols

⚠️ Caution risk of danger – consult accompanying documents.

⊙→ Input/ Output Signals

→⊙ Input Signal

⏚ Protective Conductor Terminal

⏚ Earth (Ground) Terminal

⚡ CAUTION, Risk of Electrical Shock

2.2 Safety Precautions

⚠️ **Warning** The OmniCure® PLC2000 should only be used with OmniCure® AC Series of UV LED curing solutions. Use with any other devices will not be warranted or supported.

⚠️ **Warning** Should the OmniCure® PLC2000 be used in a manner not specified by Excelitas Technologies, the protection provided by the equipment may be impaired.

> *The PLC2000 is designed for use with Excelitas Technologies' AC Series of UV LED systems. When they are being used together, it is important to take necessary UV safety precautions. Please refer to the safety warnings and precautions outlined in the AC Series documentation.*

3 Getting Started

3.1 Packaging Contents

Your package (019-00214) contains the following:

- PLC2000 external PLC controller for AC Series UV LED curing systems (014-00592R)
- Door lock jumper (018-00532R)
- 5m HD15 M-F Cable for connection to UV LED Head unit (018-00540R)

Carefully remove the contents and store the packaging materials for future use.

3.2 System Requirements

In addition to the PLC2000, you will require the following components:

- OmniCure® AC Series UV LED head

- Power supply

- Power cable

These may be sourced separately or purchased from Excelitas Technologies. Check with Excelitas Technologies to determine the appropriate components for your requirements. The following table provides the part numbers of recommended component parts, as well as a part number to order all components as a package.

	AC7150-365nm	AC7150-395nm	AC7300-365nm	AC7300-395nm
UV Head	019-00197R	019-00198R	019-00187R	019-00196R
System Controller	019-00195R	019-00195R	019-00199R	019-00199R
DC Power Cable	018-00559R	018-00559R	018-00559R	018-00559R

	AC450-365nm	AC450-395nm	AC475-365nm	AC475-395nm
UV Head	019-00194R	019-00191R	019-00193R	019-00192R
System Controller	019-00195R	019-00195R	019-00195R	019-00195R
DC Power Cable	018-00559R	018-00559R	018-00559R	018-00559R

The OmniCure® AC series product line is not limited to the solutions listed above. Please contact Excelitas Technologies or visit www.excelitas.com/omnicure for the complete product portfolio or to determine the appropriate components for your requirements.

3.3 PLC Controller Unit
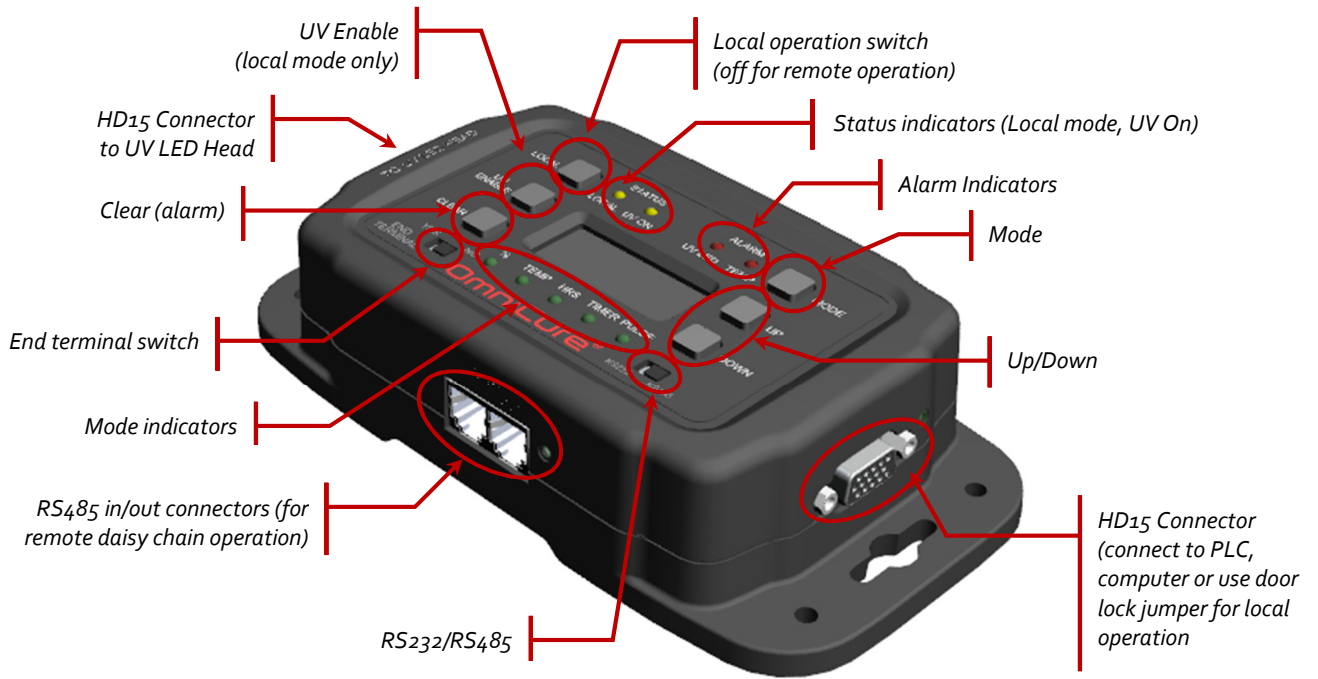
Figure 1 PLC2000 UV Head Controller

3.4 Connector Pin-Outs

HD15 PLC Connector
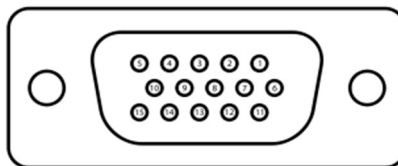
Figure 2 PLC2000 Connector – HD15 female (looking at PLC2000)

PIN	Name	Description
1	Intensity Input	Input voltage is converted to required current to achieve desired intensity; intensity will vary linearly between 20% and 100% for voltages between 1V and 5V respectively. A minimum voltage of 0.4V is required for proper light source operation. If the user inputs a voltage *below* the minimum required, the light source will not turn on.
2	Enable High	0.0V to +0.6V = Turns LEDs off (Open input will default to OFF). +2.4V to +24.0V = ON.

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PIN	Name	Description
3	Enable Low	0.0V to +0.6V = Turns LEDs on. +2.4V to +24.0V = Turns LEDs off (Open input will default to OFF).
4	Thermal Fault	0.0V to +0.4V (ground) = Fault +2.4V to +5.0V (open) = No Fault
5	Ground	Ground Reference
6	Reserved	Do not connect
7	Reserved	Do not connect
8	Door Lock *	0.0V to +0.6V = UV Emission Allowed. +2.4V to +24V = UV Emission Stopped.
9	Ground	Ground Reference
10	LED ON	0.0V to +0.4V (ground) = LED off +2.4V to +5.0V (open) = LED on.
11	TX	RS232 driver output
12	UV LED Fault	0.0V to +0.4V (ground) = Fault +2.4V to +5.0V (open) = No Fault
13	RX	RS232 receiver input
14	Clear Fault/ LED Hours	High-to-low transition clears faults; low-to-high transition initiates visual indicator sequence of accumulated LED hours
15	Temperature Monitor	Output is a voltage proportional to the maximum UV LED heat sink temperature. Conversion Factor: 0.05V/°C.

Table 1 HD15 Connector Pin Out

*   The integrated door lock function provides the integrator with a means of shielding operators from accidental UV exposure by utilising a dry contact switch on the door of the UV shield and connecting pins 5 and 8 on the PLC interface.

RJ11 Connector
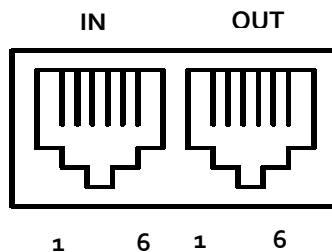
Figure 3 PLC2000 RJ11 Two port connector (looking at PLC2000)

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PIN	Name	Description
1	A	RS485 non inverting input
2	Ground	Ground
3	Reserved	Do not connect
4	Reserved	Do not connect
5	Reserved	Do not connect
6	B	RS485 inverting input

Table 2 RJ11 Connector Pin Out

4 Setting Up the PLC Controller

Please refer to the AC Series User Manual for instructions on using the UV LED head, connection of the power supply and troubleshooting tips.

4.1 Connecting the PLC2000 Controller to the UV LED Head

Note All connectors are via screw style fastener -- do not over tighten the connector screws.

Note: The following is a generic procedure, illustrated with the common components described above; please refer to specific documentation related to your power supply and controller.

Note: Mounting of the PLC2000 controller is not required. Depending on the customer integration requirements, it can be set on a bench, table top, or mounted on a panel.

1. Ensure the UV LED Head's power supply unit is turned off.

2. Connect the female end of the supplied HD15 cable to the Controller at the end labelled *To UV LED Head* (see Figure 1).

3. Attach the male end of the HD15 cable to the UV LED Head (see **Error! Reference source not found.**).

4. For Local operation, or Remote operation with just one Controller, set the *RS232/RS485* switch to RS232, and the *End Terminal* switch to Yes.

   If you will be connecting multiple Controllers in a daisy chain to be controlled in Remote operation, set the *RS232/RS485* switch to RS485. Refer to Software User Guide for more details.

   For Local operation, set the *Lock* switch to Unlock.

5. Insert the supplied Door lock jumper into the HD15 port of the Controller (at the opposite end of the one connected to the UV LED Head) (see Figure 1)

6. Power up the UV LED Head's power supply.

7. Press the *Local* button to run in Local mode (*Status » Local* indicator will be lit). If you will be controlling the PLC2000 remotely, ensure the *Local* button is not engaged (*Status » Local* indicator will be off) (see Figure 1).

8. Any UV LED or Temperature faults will be indicated by the *Alarm* indicators on the Controller. To clear, press the *Clear* button (see Figure 1).

9. Operation in local mode will mean any commands via PLC will be ignored. The PLC2000 will be controlled by the locally programmed settings.

> *The integrated Door lock function provides shielding from accidental UV exposure. The UV LED head will not turn on (in either local or remote operation) unless each Controller has either a Door lock jumper or an HD15 cable on which pins 5 and 8 have been shorted.*

4.2 Connecting Multiple Controllers (Remote operation)

The PLC2000 supports both RS232 and RS485 communications, and when paired with a system allows for multiple UV LED heads to be daisy-chained and accessed or controlled through a single computer terminal. Each PLC2000 must be connected to a UV LED Head, and each must be initialized and programmed separately for individual control of each device.

Please refer to the Software User Guide for more details on set-up and operation of the PLC2000 in remote mode.

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Note   Excelitas Technologies recommends a maximum of 8 PLC controllers be connected

5 Understanding the Display

The Controller includes a 32 x128 pixel LCD and nine LED indicators, which display user selection, UV LED Head status, any error conditions, and the Controller's working status.

5.1 LED Indicators

When the Controller is powered on and before the Controller is connected with the UV LED Head, all green LED indicators will flash at about 1HZ.

Once the UV LED head is connected and communications are established, the PLC controller will undergo a power-on and initialization process. The PLC2000 will display on the LCD the PLC2000 firmware serial number followed by the AC firmware serial version, and AC unit serial number.

If the LED indicators continue to flash and the above mentioned displays are not shown, this indicates that the initialization process has not been complete. Please check cable connections and retry.

After initialization, the indicators LED indicators mean:

| Indicator	If lit, means
Status » Local	Local control mode is on (off means Remote control)
Status » UV On	UV LED Head is on
Alarm » UV LED	There is a drive current continuity problem on the UV LED Head
Alarm » Temp	UV LED Head has detected an internal temperature that is out of range
%	Only one of these will be lit at a time; indicates which state is reflected in the LCD Display (see below)
Temp	
HRS	
Timer	
Pulse	

Table 3 LED Indicators

5.2 LCD Display Examples

Pressing the Mode button cycles through the following modes:

- **%** (Level mode - UV LED Head intensity)
- **T** (UV LED Head temperature)
- **HRS** (UV LED Head accumulated LED hours)
- **Timer** (exposure timer)
- **Pulse** – frequency and duty cycle
- **Pulse** – on/off

Note   The intensity level is displayed in the top left corner when in Temperature, Timer or Pulse Modes

Note   A door lock indicator icon is displayed in the top right corner if the door lock input is not enabled. The UV LED head will not turn on unless the signals from pin 5 & 8 are connected as outlined in Section 3.4

```
ID: 02
   Power:  100 %
```
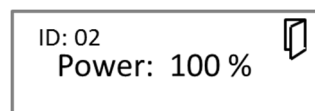
Note   The PLC2000 address or device ID will be identified in the top left corner when in % Level Mode or Hours Mode. Default address is set to 2 and can be programmed. Please refer to Software User Manual for more details.

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Note A lock indicator icon is displayed in the top right corner if the device is locked. When lock is enabled, no changes can be made to the PLC2000 device settings. The lock tab must be turned off to make adjustments.
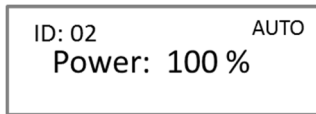
```
ID: 02                    🔒
  Power:  100 %
```
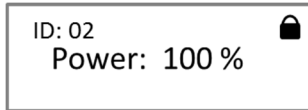
Note When working in Remote operation, you can toggle between modes to view, but not control, settings. Auto or PLC mode will also be indicated on the display. Please refer to Software User Guide for more information.

```
ID: 02              AUTO
  Power:  100 %
```

%

UV LED Head intensity level; see Section 6.1.

Temp

Information only, displays the current maximum monitor temperature inside the UV LED Head.

```
P: 50%
  Max:  65  °C
```
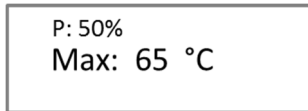
HRS

Information only, displays the UV LED Head's accumulated hours of use.

```
ID: 02
  Hour:  12345
```
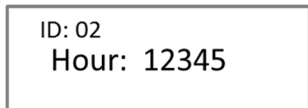
Timer

Countdown exposure timer; see Section 6.2 for details on operating this mode.

When the Status » UV ON indicator is on, displays the remaining exposure time.

If the Status » UV ON indicator is off, this display shows the user exposure setting value (in seconds).

Note   If you are operating in Remote mode, you can view the Timer settings but cannot change them.

```
P: 50%
  1234.5 s
```
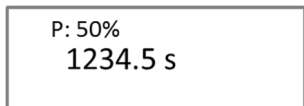
Pulse – frequency/duty cycle

Frequency and duty cycle; see Section 6.3 for details on operating this mode.

Note If you are operating in Remote mode, you can view the Pulse settings but cannot change them.

```
P: 50%
01 Hz        055%
```

Pulse – on/off

Duration of time to pulse UV LED Head on and off; see Section 6.4 for details on operating this mode.

Note On/Off timer pulse mode in milliseconds is supported in Local operation only.

```
P: 50%
O: 00123    F: 00123
```

6 Using the PLC Controller in Local Mode

Use the Controller in one of four modes:

- % – UV LED Head intensity level
- Timer – exposure timer
- Pulse – frequency and duty cycle
- Pulse – on/off

As mentioned in Section 5.2, pressing the Mode button cycles through the states reflected by the indicators below the display.

6.1   Intensity Level mode

Use the Intensity Level (%) mode to use the UV LED Head at a particular % of electrical input voltage. This can be set in conjunction with Timer mode or the two Pulse modes.

1. Press *Mode* until the *%* indicator is lit.

2. Press and release the *Up* or *Down* button to adjust the level in 1% increments (press and hold for faster adjustment). The minimum setting is 20%.

3. Press and release the *UV ENABLE* button (the *UV ON* status indicator will be lit) to turn the UV LED Head on.

4. Press and release the *UV ENABLE* button again to turn the UV LED Head off (the *UV ON* status indicator will be off).

5. Optionally, set the Timer or Pulse settings as described below.

6.2   Timer mode

Use Timer mode to turn on the UV LED Head for a set period of time.

Note   Optionally, set the Intensity Level first, as described in Section 6.1.

1. Press *Mode* until the *Timer* indicator is lit.

2. Press and release the *Up* or *Down* button to adjust the time in 0.1 second increments (press and hold for faster adjustment). The maximum timer setting is 6553.5 seconds (≥ 109 minutes).

3. Press and release the *UV ENABLE* button (the *UV ON* status indicator will be lit) to turn on the UV LED Head on for the duration specified.

4. The UV LED Head will turn off after the duration specified; to stop the timer and turn the UV LED Head off immediately, press and release the *UV ENABLE* button again (the *UV ON* status indicator will be off).

6.3   Pulse (frequency and duty cycle) mode

Use this Pulse mode to use the UV LED Head at a set frequency or duty cycle.

The minimum on/off time is 30 or 100 milliseconds, depending which UV LED Head is used; verify the minimum applicable to the UV LED Head(s) that you are using.

Note   Optionally, set the Intensity Level first, as described in Section 6.1.

1. Press *Mode* until the *Pulse* indicator is lit and the display shows the frequency (Hz) and duty cycle (%) setting (first Pulse setting).

2. Press and hold *Mode* to toggle between Hz or % (reflected by underline). Refer to the "Pulse – frequency/duty cycle" display example on page 10.

3. Press and release the *Up* or *Down* button to adjust the level in 1Hz or 1% increments (press and hold for faster adjustment). Minimum frequency is 1Hz.

4. Press and release the *UV ENABLE* button (the *UV ON* status indicator will be lit) to turn the UV LED Head on according to the frequency and duty cycle that was set.

5. Press and release the *UV ENABLE* button again to turn the UV LED Head off (the *UV ON* status indicator will be off).

6.4   Pulse (on/off) mode

Use this Pulse mode to use the UV LED Head for a specific duration. The values cannot be changed during exposure.

The minimum on/off time is 30 or 100 milliseconds, depending which UV LED Head is used; verify the minimum applicable to the UV LED Head(s) that you are using.

The maximum on or off time is 65535 milliseconds.

Note   Optionally, set the Intensity Level first, as described in Section 6.1.

1. Press *Mode* until the *Pulse* indicator is lit and the display shows the **O**n and Off (**F**) setting (second Pulse setting)

2. Press and hold *Mode* to toggle between O (on) or F (off) (reflected by underline). Refer to the "Pulse – on/off" display example on page 11.

3. Press and release the *Up* or *Down* button to adjust the time **O**n and the time Off (**F**) in 1 millisecond increments (press and hold for faster adjustment).

4. Press and release the *UV ENABLE* button (the *UV ON* status indicator will be lit) to turn the UV LED Head on.

5. Press and release the *UV ENABLE* button again to turn the UV LED Head off (the *UV ON* status indicator will be off).

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7 Using the PLC Controller in Remote Mode

Please refer to the Software User Guide for information on PLC controls in remote operation.
http://www.excelitas.com/Pages/Product/OmniCure-PLC2000.aspx .

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8   Care and Maintenance

⚠️ ⚡ **Caution**   Routine maintenance should only be completed by qualified personnel to avoid risk of injury/electrical shock to the end user. No user serviceable components are located within the PLC2000 Controller.

Ensure UV LED head is turned off prior to making any changes to cabling configurations.

9 Technical Specifications

9.1   Environmental Conditions

Operating Conditions	
Ambient Temperature	15ºC to 40ºC
Altitude:	3000m max.
Atmospheric Pressure:	700 to 1060 hPa
Relative Humidity:	10% to 80% (non-condensing)
Installation Category	II
Pollution Degree	2
Transport and Storage Conditions	
Temperature	-20 to +75ºC
Relative Humidity	0% to 80% (non-condensing)
Atmospheric Pressure	500 to 1060 hPa

Table 4 Environmental Conditions

9.2   PLC Controller Specifications

A power supply is not required for the PLC2000, but the device is rated for 5V DC, 500mA input. The PLC controller **must be** connected and paired with an OmniCure® AC series UV LED Head such as the following:

	365nm	395nm
AC450	019-00194R	019-00191R
AC475	019-00193R	019-00192R
AC7150	019-00197R	019-00198R
AC7300	019-00187R	019-00196R

The outer dimensions (in inches) of the PLC2000 are illustrated in Figure 4. Holes are provided for optional mounting of the PLC2000, but the device can be placed on a table top or bench depending on integration requirements of the customer.
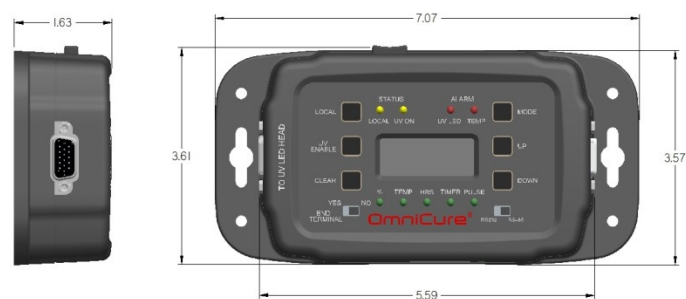

Figure 4 PLC2000 Dimensions

9.3 9.4 Regulatory Compliance

The PLC2000 has been tested and found to comply with product safety and electromagnetic compatibility requirements. For a complete list of tests and for certification details, please contact your OmniCure® representative or visit www.excelitas.com/omnicure for more details.

⚠️ ****WARNING****
Changes or modifications not expressly approved by Excelitas Technologies could void the user's authority to operate the equipment.

9.4 9.5 CE Marking

Council Directive 2014/35/EU	Low Voltage Directive	
Council Directive 2014/30/EU	EMC Directive	**CE**
Council Directive 2012/19/EU	WEEE Directive	
Council Directive 2011/65/EU	RoHS	

9.6 FCC - FCC Class A Digital Device or Peripheral – Information to User

NOTE:

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference in which case the user will be required to correct the interference at his own expense.

WARNING:
Changes or modifications not expressly approved by Excelitas could void the user's authority to operate the equipment.

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9.5 9.7 China RoHS

The following symbol above indicates that the OmniCure® PLC2000 does not contain any hazardous substances.

9.8 WEEE Directive

The symbol above indicates that this product should not be disposed of along with municipal waste, that the product should be collected separately, and that a separate collection system exists for all products that contain this symbol within member states of the European Union.

The equipment that you bought has required the extraction and use of natural resources for its production. It may contain hazardous substances that could impact health and the environment.

In order to avoid the dissemination of those substances in our environment and to diminish the pressure on the natural resources, we encourage you to use the appropriate take-back systems. Those systems will reuse or recycle most of the materials of your end life equipment in a sound way.

The crossed-out wheeled bin symbol indicated above invites you to use those systems.

If you need more information on the collection, reuse and recycling systems, please contact your local or regional waste administration.

WEEE Directive	China RoHS	RoHS	

The symbol above indicates that this product should not be disposed of along with municipal waste, that the product should be collected separately, and that a separate collection system exists for all products that contain this symbol within member states of the European Union.

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If you need more information on the collection, reuse and recycling systems, please contact your local or regional waste administration.

10 Warranty

Excelitas Technologies warrants the original purchaser for a period of one (1) full year, calculated from the date of purchase, that the equipment sold is free from defects in material and workmanship.

In the event of a claim under this warranty, the equipment is to be sent postage and carriage paid to the Excelitas Technologies Service Centre. Returned equipment will not be received without a Return Authorization (RA) Number, issued by the appropriate Service Centre.

In order for us to serve you better, include a written description of the fault and the name and telephone number of a contact person who may be contacted for additional service related questions.

Any claims for units received with defects in material or workmanship must be reported to an authorized Excelitas Technologies Service Centre within 30 days from the original date of receipt and returned within 30 days of reporting to a an authorized Excelitas Technologies Service Centre. Excelitas Technologies will repair or replace these reported defects free of charge. The equipment must be sent postage and carriage paid.

Package the equipment in its original shipping case or as appropriate to prevent damage during transport.

In the case of damage caused by wear and tear, careless handling, neglect, by the use of force or in the case of interventions and repairs not carried out by an Excelitas Technologies Authorized Service Centre, the warranty ceases to be valid. This warranty may not form the basis for any claims for damages, in particular not for compensation of consequential damages.

This warranty is not transferable.

10.1 Returning your PLC2000 to Excelitas Technologies for Service

Please make a note of the problem encountered, the steps followed to isolate the problem and the result of any trouble shooting steps taken.

Telephone the nearest Excelitas Technologies Service Centre to obtain a Return Authorization Number so that repairs may be completed quickly and efficiently. In North America, request for Return Authorization number can be made online at http://www.excelitas.com/Pages/Support/Service-Instructions.aspx.

Enclose details of the problem with the unit and return both to the Excelitas Technologies Service Centre. The unit should be returned in its original packaging if possible.

Include a phone number and contact person who may be reached for any additional service-related questions.

11 Contact Information

Excelitas Canada Inc.
2260 Argentia Road
Mississauga, Ontario
L5N 6H7 CANADA

Tel.: +1 905 821-2600

Toll: +1 800 668-8752 (USA and Canada)

Fax: +1 905 821-2055

http://www.excelitas.com/Pages/Product/OmniCure.aspx

Technical Assistance:

techsupport@excelitas.com

http://www.excelitas.com/Pages/Support/Service-Instructions.aspx

For a complete listing of Authorized OmniCure Distributors and Service Centres please go to
http://www.excelitas.com/Pages/Support/Service-Centers.aspx.

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