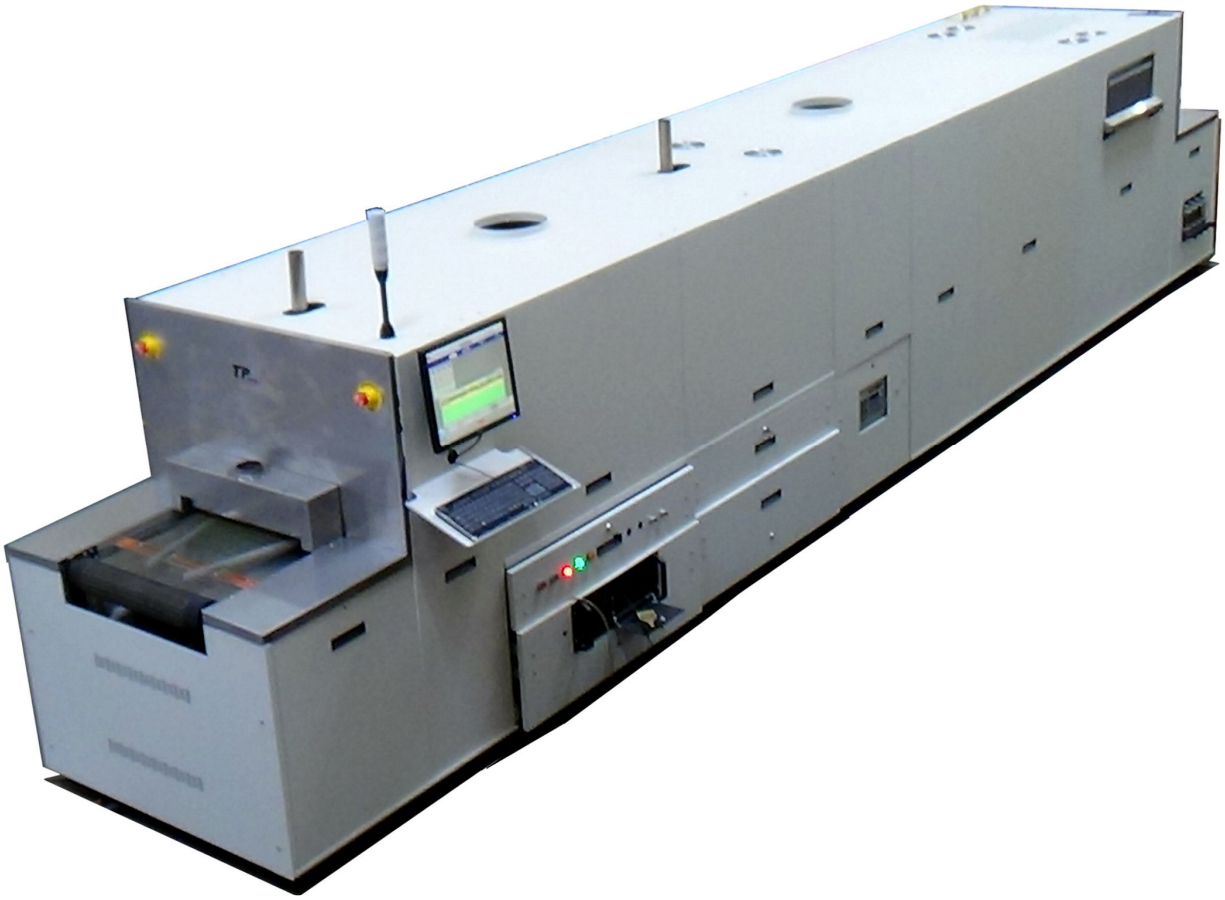
CONTINUOUS BELT
IR BELT FURNACE

TP Solar Model TF-618
Owner's Manual

Revision 0



MODEL: TF-618

SERIAL NUMBER: 2015260

FACTORY ORDER NUMBER: 15-004

Infrared Furnace Setup, Operation, Theory & Troubleshooting Guide

This Owner's Manual contains product information specific to the newly installed equipment and software. In addition, this manual contains information regarding features and options which may or may not be included in your furnace system.

Continuous Belt IR Furnace

Owner's Manual

Rev. 0

Model: TF-618

Serial Number: 1506151401

Part No. 15-004 - 676-110000-01 CD

Part No. 15-004 - 676-110000-02 Loose Leaf

Edited by: J. Clark, S. Barber, C. Roode

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Lochaber Cornwall, Inc., 675 North Eckhoff Street, Ste D, Orange, California 92868 USA

714.935.0302 fax 714.935.9809

www.LCIfurnaces.com

service@furnacepros.com

TABLE OF REVISIONS

Rev	Sections	Description	Date
0	All	Initial Release	4/10/2016

INTRODUCTION

This manual covers the TP Solar infrared high quality controlled atmosphere infrared belt furnace designed for industrial production and laboratory infrared thermal processing.

Achieving high performance and high yields is attainable with careful adjustment of the temperature and gas flow controls provided on the furnace. Infrared furnaces are highly responsive to critical temperature settings. With lamps as the primary heat source, the equipment is literally heating with the speed of light. The unique gas management system provides an extremely even distribution and well-regulated flow of gas throughout the process chambers. Understanding how to control both the heat and gas flow is essential to the effective operation of the furnace. When the interaction and performance of the control elements are well managed the tool can achieve its potential. For many, our furnaces become regarded more than just an effective tool; they are viewed as a fine instrument that can produce results over a variety of thermal processing situations.

There are many features in your equipment to help assure your success in achieving your goals. Many "firsts" involving the application of near infrared heating include: the first high temperature furnace capable of operating at 1000°C with extremely tight temperature control; the first thick film furnace; the first controlled atmosphere furnace capable of <5 ppm O2; and the first hydrogen furnace.

WHAT IS IN THIS MANUAL

This manual explains furnace equipment installation and setup, operation and troubleshooting of the TP Solar TF-618 model IR furnace. Some equipment described in this manual is optional or may not apply to your model as configured. The manual also covers aspects of infrared processing theory and techniques to assist you in achieving highly repeatable and reliable thermal processes.

Study this manual carefully. Experience has shown that clients who thoughtfully master the contents of this manual can become expert in understanding the process system capabilities of our infrared furnaces. In doing so, many are able to push the initial process performance envelope and thus achieve higher degrees in both process reliability and throughput than previously anticipated.

Note that throughout this Owner's Manual the equipment is generally referred to as a furnace. A dryer is a furnace with only the top lamp elements installed or operated.

FORMATTING CONVENTIONS

This manual uses the following formatting conventions.

DANGER: This signifies a potential threat to human safety.

Warning: This signifies a potential threat to equipment damage or product loss.

Note: This signifies an important fact that could affect process control.

Examples are shown in italic text.

Bold text words or phrases embedded in this document, are terms with definitions in the glossary.

Bold Underlined text is used for pop-up windows, button descriptions & selector button/box choices.

Cross-references to "Section Titles" are bound with quotes.

(Optional ❒) accessories will be shown in parenthesis with a checkbox. If supplied, please check the box as appropriate.

ABOUT LCI

LCI Furnaces specializes in the application and sales of high quality near infrared (0.5-5.5 µm) wavelength continuous belt dryers, ovens and furnaces worldwide. If needed, LCI can aid in the selection new equipment and features or rebuild of an existing furnace to meet the special and challenging needs our partners require. Should you have a furnace operating question, contact LCI Furnaces or FurnacePros Technical Support. LCI furnaces represents TP Solar for new furnace equipment sales.

LCI Websites

New Furnaces: www.LCIfurnaces.com
Rebuilt RTC Furnace Support: www.FurnacePros.com

Contact:

Phone: (714) 935-0302
e-mail: Info@LCIfurnaces.com

ABOUT TP Solar

TP Solar, Inc. was founded by furnace experts who pioneered IR furnaces and set the industry standards for the PV industry in the early 1980s. TP Solar is committed to delivering the greatest total value to make its customers more productive, more competitive and more profitable. They accomplish this goal by having the most technically talented product application people, the most customer focused support personnel, and by continuously improving our business processes. For questions about the furnace described in this manual, contact TP Solar or your sales representative.

WHERE TO GET HELP

TP Solar Corporate Offices & Factory

Address: 16310 Downey Avenue, Paramount, CA 90723 USA
Phone: (562) 808-2171
Fax: (562) 529-2483

TP Solar Technical Support, Parts & Service

Department: Aftermarket
Phone: (562) 808-2171
e-mail: sales@tpsolar.com

Website

Furnace Equipment: www.TPSolar.com

EQUIPMENT LIST

Verify that the following equipment was received.

Qty	Unit	Description	Part Number
(1)	ea	TF-618 Furnace	15-004-TF-618

In addition verify that you received the following, shipped separately.

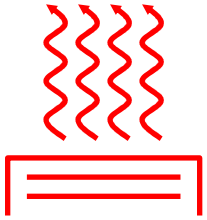
Qty	Unit	Description	Part Number
(1)	ea	Manual, Owner's, 3-Ring Bound	15-004-676-110000-02
(1)	ea	CD Media, Owner's Manual, P/N 15-004-676-110000-01	15-004-676-110000-01
(1)	set	CD Media, TPSI Furnace software, backup	
(1)	ea	CD Media, Reinstallation, Windows operating system	
(1)	set	CD, Drivers and Utilities	

GENERAL SAFETY GUIDELINES

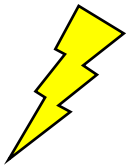
The following set of guidelines is intended to create awareness of potential health and safety hazards.

Normal Good Laboratory Practice

Normal good laboratory practices apply to the operation of IR furnaces. Do not use the space above the furnace as storage. Do not block the cabinet doors preventing the cooling of the electronic equipment inside. Do not operate with side covers off as this will prevent normal cooling of the electronic equipment thus voiding the warranty. Tuck electrical cords out of the way. Do not store flammables in the vicinity of the furnace and especially while operating the furnace with an oxygen atmosphere.

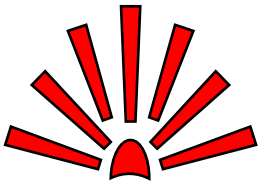


HIGH TEMPERATURES. In general, the operation of any furnace may expose operators or maintenance technicians to the risk of burns. After being processed in an infrared furnace, customer product may still be dangerous to handle. Each owner is responsible for providing a safe work environment and proper training in the handling of material being processed in a furnace.



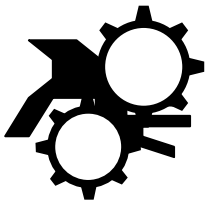
ELECTRICAL SHOCK HAZARD. IR furnaces operate at high voltages. Operation with side covers off constitutes a safety hazard. Ensure that main power is off while side covers are removed.

Electrical shock hazards exist for those technicians who service the furnace. High voltages are required to operate the furnace and precautions must be taken to reduce the exposure to these elements. Again, it is the responsibility of the furnace owner to assure that only properly trained service technicians, familiar with high voltage operations be allowed to service the equipment

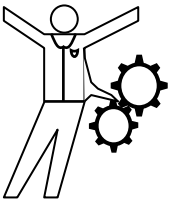


EXPLOSION Explosive dangers may exist in the high temperature process environment of the furnace. If the furnace operates with process gas containing hydrogen, measures must be taken to avoid the dangers of explosion. Furthermore, improper gas flow balance may draw oxygen rich air into the furnace, mixing with effluent gases and material from products, also creating a hazardous environment.

HAZARDOUS MATERIALS. Persons performing maintenance tasks such as replacement of lamps may become exposed to silica fiber compounds. Such tasks should be performed by qualified persons wearing gloves, eye protection and a facemask to prevent inhalation of particulates.



ROTATING EQUIPMENT. Roller dangers exist when working around the conveyor belt of the furnace. Care should be taken not to place hands or garments on or near the belt drive mechanisms when the conveyor system is operating as roller crush may occur. Operators should avoid walking near the open ends of the conveyor belt. Those who must be near the moving parts should wear close fitting clothing.



SAFETY EQUIPMENT

EMO Buttons

Each infrared furnace is fitted with at least four SEMI S2 compliant Emergency Stop or Emergency Machine Off buttons (EMO's), two located at each end of the furnace. Each Emergency Machine Off button is attached directly to a switch that automatically shuts down all furnace electrical systems. In many cases, process gas flow will remain on after power is shut off.

Locate and insure their proper function prior to regular furnace operation.

High Voltage Protection

The furnace is equipped with a three-phase disconnect switch located on the rear side near the furnace entrance. The 3-phase disconnect switch must be in the OFF position before the panel can be removed for service access.

The furnace is equipped with electrical drawers that are secured by drawer locks to discourage operation of the furnace with high voltage exposed to operators. Within the drawers, clear plastic (Lexan™) shields further isolate individuals from exposure to electrical equipment where dangerous voltages are present. Each of the drawers located on the front of the furnace closest to the furnace entrance is safeguarded by lock to limit access to the high voltage areas.

Removal of top access covers requires a tool (removal of 2 screws per panel). When a top cover is removed near the furnace heating chamber, the user may be exposed to hot surfaces, but the electrical lamp terminals containing high voltage are enclosed by an inside cover. Further in order to access lamps and lamp wires, the plenum covers must be removed. The furnace should be disconnected from its power source before the furnace sections with lamps are accessed by maintenance or testing personnel.

DANGER: Removing access panels or unlocking and opening the drawers while the furnace is operating increases maintenance personnel exposure to electrical hazards. The user must ensure that all drawers are closed and locked before the furnace is returned to normal operation following any inspection or adjustment.

Other Protection

In the cooling section of the furnace, fan guards provide protection from rotating parts. Line voltage 120 Vac electricals are protected by insulated wire. Service and maintenance should exercise caution when accessing this section of the furnace while the furnace is connected to its power source.

Safety with Forming Gas, FG (Nitrogen/Hydrogen Premix)

The three-gas, dual mode option provides for separate manifolds to allow users to select one or two of three connected gases for the process gas at the same time. Use of Forming gas (FG) is generally safe provided the concentration of hydrogen in the mixture is lower than the lower flammable limit of hydrogen. Hydrogen is flammable in concentrations of 4-74% in air; explosive range is 18-59% in air. Dual and Tri-gas furnaces are equipped with an audible alarm to indicate low nitrogen and/or forming gas supply pressure.

DANGER: Combustible gas should NOT be connected to this furnace. Forming gas or other gas mixtures which have a combustible gas component can be safely introduced into furnace provided the delivered concentration is below its lower flammable limit (LFL) in air.

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