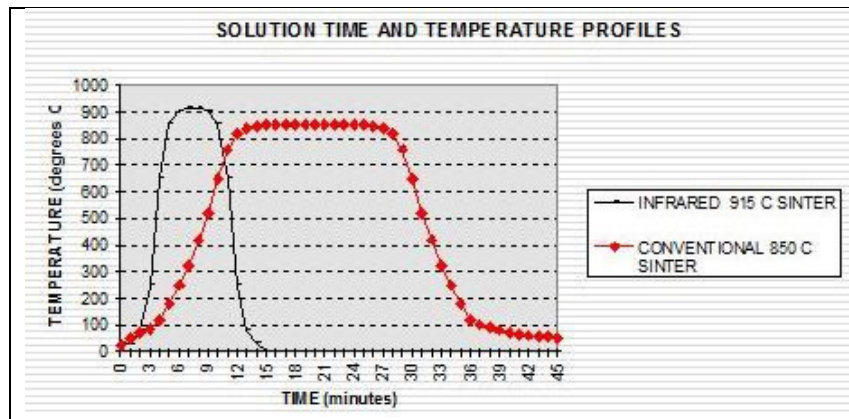


Thick Film Processing

TF Series infrared furnaces have been specifically engineered for thick film and hybrid circuit applications. Processes include firing dielectrics, conductors and resistors on ceramic, porcelain and metallic substrates in air, nitrogen or forming gas (mixture of hydrogen/nitrogen) atmospheres. Unique technology provides outstanding performance and low cost of ownership.



- Short dwell time at peak temperature (3-4 minutes instead of 10)
 - Limited time at temperature avoids materials migration/diffusion issues
- Parts complete processing in 15 minutes instead of 45
 - Shorter production time means higher output per furnace
- Controlled cooling returns product to room temperature without thermal shock
- Can be used for both drying and sintering functions
- Lower operating energy costs



As a result of the high equilibrium heat transfer of the IR lamps in the furnace, dwell time in a near infrared furnace can be quite short compared to a conventional convection furnace. The physical structure of thick film materials is developed very quickly, and the overall time/temperature product is relatively small.

Because of the penetrating power of high intensity IR radiation, the organic volatiles within thick film inks and pastes essentially sublime completely from the structure without eruption.

Thick Film Profiling in an IR Furnace

For most thick film processes in these infrared furnaces, the rate of temperature rise in the product can be made quite fast, the volatilization and sublimation of organic binders being completed long before sintering temperatures are attained. To achieve this result, the first zone should be driven as hard as practical to maintain the highest intensity near infrared radiation, reaching process temperature at the beginning of subsequent holding zone(s). The holding zones are set to maintain sintering temperatures in the product. Dwell time in these zones should be just sufficient to drive the pyrolysis or polymerization to completion. By limiting the time at temperature in this manner, unacceptable materials migrations or diffusions can be avoided.

Thick Film IR Furnace Arrangement

THERMAL PROCESSING

Function	TF-300 Models	TF-600 Models	TF-900 Models	TF-1200 Models
Load Station	380 mm			
---	Start of IR Heating Section			
Entrance Isolation Baffle with Venturi Exhaust	380 mm			
IR Heat Zones, Chamber 1	3 x 250 mm	3 x 250 mm	2 x 380 mm	2 x 380 mm
Burnout Venturi Exhaust	Not required	Yes	Yes	Yes
IR Heat Zones, Chamber 2	---	3 x 250 mm	2 x 380 mm	2 x 380 mm
IR Heat Zones, Chamber 3	---	---	2 x 380 mm	2 x 380 mm
IR Heat Zones, Chamber 4	---	---	---	2 x 380 mm
---	Start of Cooling Section			
Transition Tunnel with Venturi Exhaust	380 mm, CDA or N2 convective cooling			
Typical No. of Cooling Modules (varies with throughput requirements)	1 x 760 mm	1 x 760 mm	2 x 760 mm	3 x 760 mm
Cooling Module Choices	Each of these Cooling Modules fits 1 x 760 mm space: 1. CACT – CDA or N2 convective and radiant cooling, exterior fan heat removal 2. CWWC – CDA or N2 convective and radiant cooling, water jacket heat removal 3. CM – Fan-driven ambient air cooling, placed after Exit Isolation Baffle			
Exit Isolation Baffle (omitted if cooling is all CM modules)	280 mm, CDA or N2 convective cooling			
Unload Station	380 mm			
Total Length (approximate)	3400 mm	4160 mm	5680 mm	7200 mm

Furnace Specifications for Thick Film Furnace Models

SPECIFICATIONS

Parameter	TF-300 Models	TF-600 Models	TF-900 Models	TF-1200 Models
Belt Size: model, nominal width	TF-309, 24 cm/9.5 in TF-315, 38 cm/15 in	TF-609, 24 cm/9.5 in TF-615, 38 cm/15 in	TF-909, 24 cm/9.5 in TF-915, 38 cm/15 in TF-924, 61 cm/24 in	TF-1209, 24 cm/9.5 in TF-1215, 38 cm/15 in TF-1224, 61 cm/24 in
Belt Speed	25-510 mm/min (1-20 ipm), other speeds available			
Conveyor Belt	BNV- low mass, stabilized Nichrome-V			
No. Controlled Zones	3	6	6	8
Process Gas	1. CDA 2. Nitrogen (-N) 3. Forming Gas with premixed Hydrogen and Nitrogen (-FG) 4. Forming Gas with in-furnace mixed Hydrogen and Nitrogen (-HO)			
No. Gas Control Flowmeters	7	9	10	11
Exhaust	Improved venturi exhaust stacks reduce furnace gas consumption. Flowmeter controlled.			
Temperature Capacity, max	1000°C			
Electrical	All models include universal transformers which accommodate 208-480 Vac and 50/60 Hz frequency anywhere in the world, allowing furnace relocation without external equipment. All furnace systems are phase balanced to improve facility efficiency. IR lamp controls automatically keep IR spectrum constant.			

Thick Film IR Furnace Typical Options

Standard features are listed on the Standard Features pages (see link below). Popular options include the following:

POPULAR OPTIONS

Code	Description	Code	Description	Code	Description
EM	Element Monitors	OA	Oxygen Analyzer	AFR	Coalescing Air Filter & Regulator
MA	Moisture Analyzer	EH	Edge Heaters	IR-E	Entrance Interface Roller, small diameter
LT	Process Ready Light Tower	CB	Circuit Breaker	IR-X	Exit Interface Roller, small diameter