

CASE STUDY

Conveyorized Electric Heat Shrink Oven for Wiring Harness Heat Shrink Processing

Compact continuous conveyorized electric Class B oven engineered for heat shrinking components on wiring harnesses — featuring a 30 in W × 36 in D × 6 in clear-height work area, 426°F operating temperature with ±10°F uniformity, 24 kW electric resistance heating, 1,500 CFM vertical-down airflow at 2,500 FPM, a Teflon-coated fiberglass belt conveyor at 2–6 ft/min, four conveyor E-stop stations, NFPA 86 Class B architecture, and a pre-tested 4,500 lb assembly.

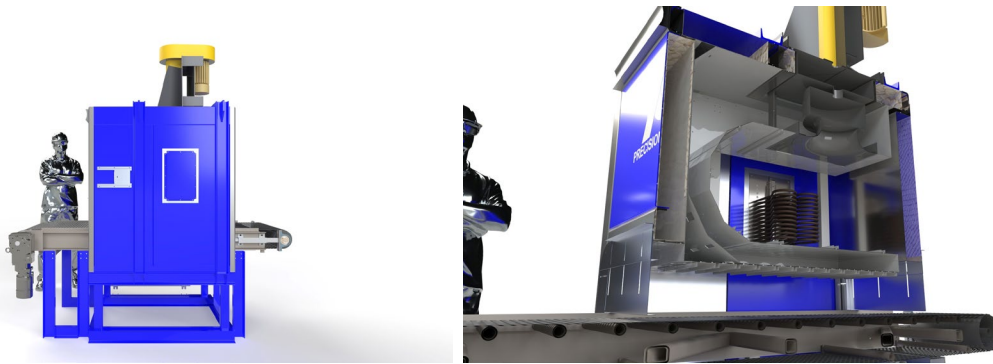


OVERVIEW

A compact conveyorized electric oven was developed for heat shrinking components on wiring harnesses. The system was designed as a continuous-processing oven rather than a batch chamber, allowing product to move steadily through a controlled heated zone on a Teflon-coated fiberglass belt conveyor.

The process concept centered on delivering repeatable heat exposure to relatively small components as they passed through the work area. The oven was configured with a top-mounted recirculation system, vertical-down airflow through adjustable supply slots, electric resistance heating, and a compact insulated shell sized for straightforward integration into a production environment.

The resulting system combined a single heated zone, continuous conveyor motion, manual conveyor speed adjustment through a variable frequency drive, and a simple NEMA 1 controls package. The design emphasized controlled airflow, thermal consistency, compact footprint, and practical service access for a straightforward heat-shrink application. The equipment was pre-assembled, pre-wired, pre-tested, and balanced prior to shipment.



CUSTOMER PROCESS REQUIREMENTS

The process requirement was to heat shrink components on wiring harnesses using a compact continuous conveyorized process. The application centered on connectors and related harness components passing through the oven on a belt conveyor rather than being manually loaded into a batch chamber.

Application Requirement

- The equipment was required to heat shrink components on wiring harnesses in a continuous pass-through conveyor process.
- The application centered on connectors and related harness components moving steadily through the heated work area rather than being loaded into a batch chamber.
- The overall need was for a practical continuous oven capable of delivering repeatable thermal exposure to wiring-harness components within a compact production setup.

Conveyor / Process Requirement

- A simple, repeatable conveyor process was required to move product continuously through the heated work area at an adjustable speed.
- The oven had to provide a compact conveyor path, stable product presentation through the heated zone, and a straightforward operator interface for starting the recirculation fan, running the conveyor, and adjusting line speed.

Footprint / Integration Requirement

- The system needed to fit within a relatively small footprint while maintaining adequate access for installation, operation, and maintenance.
- Shipping and receiving access basis: 12 ft W × 16 ft H dock door.

Safety / Classification Requirement

- The oven was configured as NFPA 86 Class B with no VOCs allowed, making it well suited for controlled heat-shrink processing without the added complexity of a Class A volatile-handling architecture.

Utility Requirement

- Required electrical service: 208V / 3PH / 60Hz. Full load amperage: 78.5 A.

THERMAL PROCESS REQUIREMENTS

The thermal process requirements were established from the need to heat shrink components on wiring harnesses in a controlled continuous-conveyor environment.

Temperature Capability

- Operating temperature: 426°F.
- Maximum temperature: 450°F.
- Required work-area uniformity: ±10°F, referenced at multiple locations on the supply-duct face.

Process Basis

- The thermal process basis is continuous heat shrinking of components on wiring harnesses.
- The process was built around a compact heated zone with controlled vertical airflow, adjustable conveyor speed, and repeatable electric heat delivery appropriate for continuous heat-shrink processing.
- No VOCs allowed. Oven classification: NFPA 86 Class B.

Heat Input Requirement

- Heat source: electric resistance heat. Heating elements: 1 kW Inconel elements. Total installed heat: 24 kW.
- Heater configuration: two heater banks of 12 kW each with solid-state relay power control.

Airflow Delivery Requirements

- Airflow pattern: vertical down.
- Total circulated air volume: approximately 1,500 CFM at 3 in. w.c.
- Recirculation fan: New York Blower 128 PLR plug fan; 2 HP TEFC motor.
- Supply discharge: adjustable slots at 2,500 FPM through 18 gauge aluminized steel supply duct.
- Return concept: open return through sides of chamber.

Exhaust / Ventilation Basis

- Exhaust type: non-powered exhaust, consistent with Class B electric process.

- Exhaust opening: 7 in. × 4 in. Fresh air inlet provided on oven body.

EQUIPMENT CONCEPT & ARCHITECTURE

To deliver the process requirements for this wiring harness heat-shrink application, the following equipment concept and architecture was developed.

Overall Concept

- One compact conveyorized electric Class B oven for continuous heat shrinking of wiring harness components.
- Single heated zone with vertical-down airflow, continuous belt conveyor motion, and a straightforward controls architecture matched to the heat-shrink duty.

Heating Architecture

- Heat source: electric resistance. Total heat: 24 kW across two 12 kW heater banks.
- Heating elements: 1 kW Inconel elements. Heat control: solid-state relay control per bank.

Airflow / Recirculation Architecture

- Airflow pattern: vertical down. Top-mounted recirculation system directing heated air downward through the work area; open return through sides.
- Recirculation fan: New York Blower 128 PLR plug fan — approximately 1,500 CFM at 3 in. w.c.; 2 HP TEFC motor.
- Supply discharge: adjustable slots at 2,500 FPM through 18 gauge aluminized steel duct.
- Exhaust: non-powered, 7 in. × 4 in. opening with fresh air inlet on oven body.

Conveyor / Handling Architecture

- Conveyor type: Teflon-coated fiberglass belt conveyor, 30 in. wide, 86 in. total length.
- Conveyor drive: Nord right-angle helical-bevel gearmotor, 1/3 HP, through Allen-Bradley PowerFlex 525 VFD; speed range approximately 2–6 ft/min.
- Speed adjustment: manual 10 kohm potentiometer. Take-up: spring-loaded. Head/tail pulleys: crown type.
- Load area: 18 in. Unload area: 22.625 in. Conveyor height: 36 in. above finished floor.
- E-stop stations at load left, load right, unload left, and unload right — each disables the conveyor only.

Shell / Construction Architecture

- Work area: 30 in. wide × 36 in. deep × 6 in. clear height above conveyor belt.
- Overall dimensions: 95.68 in. L × 68.50 in. W × 103.30 in. H. Approximate weight: 4,500 lb.
- Wall construction: 4 in. thick walls with 4 in. of 6 lb mineral wool insulation.
- Interior: aluminized steel. Exterior: carbon steel, PQ Blue finish. Control panel finish: gray / PQ White.

Controls Architecture

- Control enclosure: oven-mounted NEMA 1, 36 in. × 36 in. × 12 in., listed to UL 508A Open Industrial Control Panel.
- Temperature controller: SSI 804, 1/4 DIN. Work-area overtemperature protection: Gefran 650L.
- Manual operator controls for recirculation fan start and conveyor run; conveyor speed via potentiometer.

- Motor starters: IEC type. Non-fused 100A disconnect switch included. Recirculation fan airflow switch included.
- Applicable standards basis: NFPA 79, NFPA 86, UL 508A.

TECHNICAL SPECIFICATIONS

Oven Configuration	
Type	Conveyorized electric Class B oven
Process Style	Continuous conveyor
Work Area Width	30 in.
Work Area Depth	36 in.
Clear Height Above Belt	6 in.
Conveyor Height	36 in. above finished floor
Approx. Overall Dimensions	95.68 in. L × 68.50 in. W × 103.30 in. H
Approx. Overall Weight	4,500 lb
Shipping / Receiving Basis	12 ft W × 16 ft H dock door

Thermal Heat Power System	
Operating Temperature	426°F
Maximum Temperature	450°F
Temperature Uniformity	±10°F
Heat Source	Electric resistance heat
Total Heat Power	24 kW
Heater Configuration	Two heater banks, 12 kW each, with SSR power control
Heating Elements	1 kW Inconel elements
Oven Classification	NFPA 86 Class B
VOC Handling	No VOCs allowed

Recirculation / Airflow System	
Airflow Pattern	Vertical down
Total Circulated Air Volume	Approx. 1,500 CFM at 3 in. w.c.
Recirculation Fan	New York Blower 128 PLR plug fan
Recirculation Fan Motor	2 HP, TEFC
Supply Duct Material	18 gauge aluminized steel
Supply Discharge Type	Adjustable slots at 2,500 FPM
Return Concept	Open return through sides

Exhaust System	
Exhaust Type	Non-powered exhaust

Exhaust Opening	7 in. × 4 in.
Fresh Air Inlet	Provided on oven body

Conveyor / Handling System

Conveyor Type	Teflon-coated fiberglass belt conveyor
Conveyor Belt Width	30 in.
Total Conveyor Length	86 in.
Load Area Length	18 in.
Unload Area Length	22.625 in.
Conveyor Drive	Nord right-angle helical-bevel gearmotor with Allen-Bradley PowerFlex 525 VFD
Drive Horsepower	1/3 HP
Conveyor Speed	Approx. 2–6 ft/min
Speed Adjustment	Manual 10 kohm potentiometer
Take-Up	Spring-loaded
Head / Tail Pulleys	Crown type
E-Stop Stations	Load left, load right, unload left, unload right (conveyor disable only)

Construction Materials / Finish

Wall Construction	4 in. thick walls with 4 in. of 6 lb mineral wool
Interior	Aluminized steel
Exterior	Carbon steel
Exterior Finish	PQ Blue
Control Panel Finish	Gray / PQ White

Safety & Compliance

NFPA 86 Classification	Class B
Applicable Standards	NFPA 79, NFPA 86, UL 508A Open Industrial Control Panel
Recirculation Airflow Safety	1 recirculation fan airflow switch
Work-Area High Limit	Gefran 650L
Disconnect	Non-fused 100A disconnect switch

Controls & Electrical

Facility Voltage	208V / 3PH / 60Hz
Full Load Amperage	78.5 A
Control Panel	NEMA 1, 36 in. × 36 in. × 12 in.
Temperature Controller	SSI 804, 1/4 DIN
Overtemperature Controller	Gefran 650L

Conveyor VFD	Allen-Bradley PowerFlex 525
Conveyor Speed Control	10 kohm potentiometer
Motor Starters	IEC type
Panel Listing Basis	UL 508A Open Industrial Control Panel

Process Summary	
Product	Wiring harness components / connectors
Market / Application	Wiring harness manufacturing
Process Type	Continuous heat shrinking on Teflon-belt conveyor
Product Flow	Continuous pass-through conveyor process
Testing / Validation	Pre-assembled, pre-wired, pre-tested, and balanced prior to shipment
Key Verification Concept	Repeatable vertical-down heat delivery, adjustable belt speed, and stable temperature control for continuous heat-shrink processing



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