



ST-WSN

Steam Heat Shrink Tunnel ST-WSN300-2M and ST-WSN300-3M

User Guide



ST-WSN300

Steam Heat Shrink Tunnel Models 2M and 3M

User Guide

Revised 6/12/2019

P/N 4510010 Rev A

Copyright and Trademarks

Copyright ©2019 American Film and Manufacturing

All rights reserved. All trademarks and brand names are the property of their respective owners.

AFM

7041 Boone Avenue North

Brooklyn Park, Minnesota 55428

Phone: 714-974-9006

Fax: 763-795-8867

www.afmsleeves.com

Contents

- Safety.....8**
 - Warnings 8
 - Cautions 9
- Introduction10**
 - System Components 11
 - System Specifications 12
 - Machine Dimensions 12
 - Tunnel Dimensions 12
 - Steam Pressure 12
 - Water Consumption..... 12
 - Boiler Requirements..... 12
 - Label Types 12
 - Optional Equipment..... 12
- Installation and Setup.....13**
 - Work Area 13
 - Plumbing 13
 - Maintenance Access 13
 - Boiler Requirements..... 13
 - Steam Supply 13
 - Steam Piping Installation Recommendations 13
 - Steam Exhaust System 14
 - Drip Pans 14
 - Unpacking 14
 - Heat Tunnel Placement..... 15
 - Heat Tunnel Configuration 16
 - Steam Valves and Connections 16
- Steam Tunnel Components.....17**
 - Steam Manifolds 18
 - Drip Skirt 18
- Operation19**
 - Theory of Operation 19
 - Shrink Ratio 19

Pressure and Temperature.....	19
Label and Container Materials.....	19
Tunnel Startup.....	20
Adjusting Steam Manifolds.....	20
Tunnel Shutdown	21
Troubleshooting	22
Maintenance	23
Mounting Hardware and Connections	23
External Cleaning.....	23
Parts Lists	24
WSN-300 Parts List.....	24
Recommended Spare Parts List	25
Component Dimensions	26
Warranty Statement	27
Limitations.....	27
Repairs.....	27
Shrinking Quality	27
Shipping Policy.....	27
Exclusions	27
Warranty Verification.....	28
Warranty Eligibility.....	28
Limited Warranty	28
Disclaimer of Damages	29
AFM Technical Support.....	30

Safety

Follow these safety steps to ensure smooth and safe operation:

- All operators should study this manual thoroughly before operating the machine.
- Always follow GMP (Good Manufacturing Practices) when operating this machinery.
- The machine is heavy. While unpacking and setting up the unit, use proper lifting techniques. Avoid overreaching and leaning over while handling the machine and accessories. Use more than one person to lift and move the tunnel.
- Wear safety shoes and work gloves when moving the machine.
- Beware of uneven spots on the factory floor; the machine could tip over.
- The equipment generates heat, so make sure the area is properly ventilated.
- Do not place any body parts or tools into a running machine.
- Turn off the steam supply and allow the machine to cool before performing service and maintenance.

Warnings

Every effort has been made to ensure safety while operating this machine. However, certain risks remain. Inform all personnel of the following warnings before operating this machine.

- All operators should study this user guide thoroughly before operating this machine.
- To prevent injury to machinery and personnel, do not increase settings on steam or mechanical overload safety devices.
- Keep hands away from moving conveyors and assemblies. Conveyor belts that have become worn or frayed can be hazardous and should be replaced promptly.
- Never operate this or any moving equipment without all covers and guards in place. The internal mechanism of most packaging machinery contains numerous pinch, shear, and in-running nip points, many of which are capable of causing severe injury and permanent disfiguration.
- To minimize potential for personal injury, ensure that machine operators and others working on machinery are properly trained in the correct usage of the equipment and properly instructed regarding the safety procedures for operation.
- Do not make any modifications to the steam plumbing or the mechanical assemblies of this machinery. Such modifications may introduce hazards that would not otherwise be associated with this machinery. American Film & Machinery will not be responsible for any consequence resulting from such unauthorized modification.

- The use of certain types of plastic films in sealing and shrinking equipment may result in the release of hazardous fumes due to the degradation of the film at high temperatures. Before using any plastic film in this equipment, the manufacturer or supplier of the film should be contacted for specific information concerning the potential release of hazardous fumes. Adequate ventilation should be provided at all times.
- Keep combustible and explosive materials away from this equipment. The equipment may be a source of ignition.
- Use caution when using with pressurized containers. Exposure to high temperatures can cause pressurized containers to burst and could cause injury to operators and other personnel nearby.
- Take care when clearing product jams inside the heat tunnel. Do not use anything that could potentially puncture a container. If containers remain in the heat chamber, turn off the steam supply and allow the temperature to drop below 100 °F before clearing. Temperatures inside the tunnel can cause burns.

Cautions



HOT SURFACES: May cause burns. Do not touch when equipment is operating.



FUME HAZARD: Some fumes may be a health hazard with prolonged exposure. Ensure that the area has adequate ventilation.



LIVE STEAM: Some areas will be very hot.



PINCH HAZARD: Keep hands clear.



CUT HAZARD: Keep hands clear.

Introduction

The intended use of AFM heat shrink tunnels is for the shrinking of heat shrink film (labels, tamper bands, multipack) on containers over which they have been applied. Containers with labels enter the tunnel on the conveyor. Adjustments include pressure, horizontal, vertical, and rotational, and speed. It is possible to run several different types and sizes of product during the same work shift.

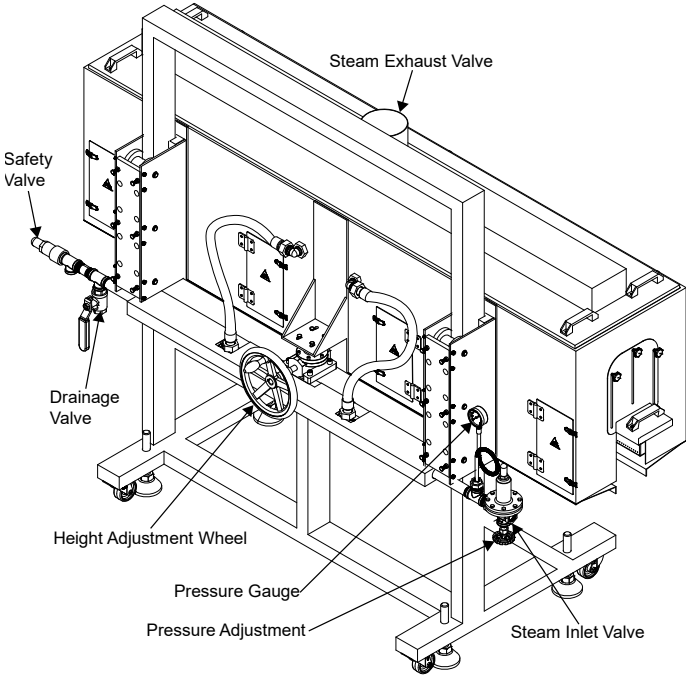
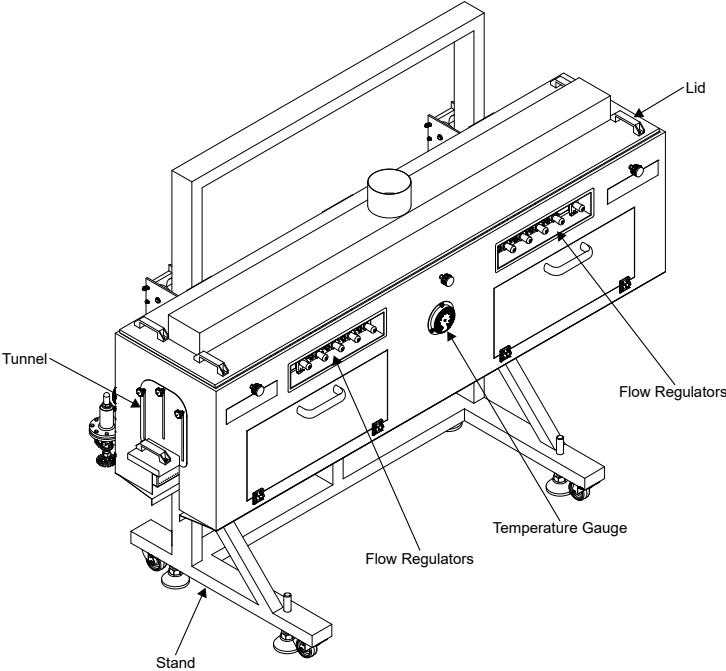
The heat tunnel incorporates 16 steam manifolds which can be adjusted by the operator to correspond with the application. It is recommended to set up the tunnel manifolds in a position that will maximize the steam application based on product type and shape. Refer to the “Steam Manifolds” section on page 18.

The identifying terms “2M” and “3M” refer to the length of the tunnel chamber in meters.

AFM shrink tunnels are intended for industrial use only.

System Components

- Stainless Steel Incorporated Stand with Levelling Feet
- Steam Heat Tunnel with Adjustable Heat Applicator Manifolds
- Steam Adjustment Controls



System Specifications

Machine Dimensions

Length: 2M version is 2000 mm (78.7 inches); 3M version is 3000 mm (118.1 inches)

Width: 900 mm (35.4 inches)

Height: 1700 mm (66.9 inches)

Tunnel Dimensions

Length: 2M version is 2000 mm (78.7 inches); 3M version is 3000 mm (118.1 inches)

Width: 130 mm (5.1 inches)

Height: 300 mm (11.8 inches)

Steam Pressure

3–4 kg/cm² (43–57 psi)

Water Consumption

200 Liters/Hour (52 Gallons/Hour)

Boiler Requirements

Minimum steam capacity of 7 BHP for 2M version

Minimum steam capacity of 10 BHP for 3M version

Label Types

PVC, PETG, OPS, and PLA.

Optional Equipment

Conveyor	Conveyor is customer-supplied. For conveyor options, consider an Easteey conveyor system.
Accumulator	Accumulator is customer-supplied. For Accumulator options, consider an Easteey Accumulator system.
Feed Screw	Feed Screw is customer-supplied. For Feed Screw options, call AFM Customer Service.
Sleever	Sleever is customer-supplied. For Sleever options, consider an AFM Sleever system.
Brush Down	The Brush Down unit is customer-supplied. For Brush Down options, call AFM Customer Service.
External Controls	Call AFM Customer Service for details.
Drip Pans	Drip Pans are customer-supplied. Refer to the “Drip Pans” section on page 14.

For any sales-related questions, call 763-398-1743.

Installation and Setup

Work Area

The WSN300 may require occasional cleaning due to environmental contaminants.

Plumbing

- All plumbing connections must be installed by a licensed plumber. Refer to all applicable national and local plumbing codes for specific installation requirements.
- A proper steam connection (customer-supplied) to the water inlet of the tunnel is needed.

Maintenance Access

When planning the installation, allow for easy access to the tunnel so that cleaning and maintenance can be done conveniently.

IMPORTANT: Turn off steam and allow the steam tunnel to cool before performing cleaning or maintenance.

Boiler Requirements

A WSN300-3M requires a minimum steam capacity of 10 BHP. This is equivalent to a boiler thermal output of 330,475 Btu/h (98.11 kW) and is the energy rate needed to evaporate 345 lbs. (156.5 Kg) of water in one hour.

Actual steam requirements depend upon variables such as line speed, fill temperature, container size, label length, ambient temperature and the label shrink ratio. The label shrink ration is the percentage of circumference change between the unshrunk and the shrunk label.

Steam Supply

The steam source, steam drainage, and steam exhaust are customer-supplied. Use clean, dry, filtered, or softened steam. The WSN300 functions best with dry steam. Steam dryness is a function of boiler pressure, steam temperature, and piping characteristics.



CAUTION: If the WSN300 shares facility steam with other systems, ensure that a sudden demand for process steam does not affect the regulated pressure to the tunnel.

Steam Piping Installation Recommendations

When installing steam piping to the WSN300, observe the following considerations:

- Ensure proper layout, design, and sizing of steam piping.
- Ensure that piping is always pitched in the direction of steam flow.

- Install eccentric reducers flat at the bottom of the horizontal section to eliminate condensate collection in low spots.
- Install a water separator immediately upstream of WSN300 pressure regulator. For example, a TLV cyclonic separator.
- Install drip pans to remove condensate. Refer to the “Drip Pans” section on page 14.
- Install steam main branch takeoffs from the top of the pipe.
- Install strainers upstream of control valves and traps.
- Install a cartridge filter upstream of the water trap to prevent contamination from metal particles.
- Install a steam exhaust duct and an exhaust fan to expel used steam.

Steam Exhaust System

A steam exhaust system (customer-supplied) is strongly recommended.

A section of flexible duct is recommended for attachment to the WSN300 Exhaust Port to facilitate tunnel height adjustment, manifold height adjustment, and to clear jams inside the tunnel.

A roof-mounted steam exhaust fan of 350 CFM capacity is recommended for a 20–30 feet to expel steam before it condenses inside the duct. Adjustable flow by means of a speed-controlled fan drive or a damper inside the duct is also recommended. The fan motor should have wet duty and high temperature ratings.

An alternate exhaust configuration includes a Steam Exhaust Blower to facilitate horizontal steam expulsion through an adjacent wall. The Blower connects the Flexible Duct to a horizontal pipe that carries steam out through a wall mounted vent.

Drip Pans

Installing optional Drip Pans (customer-supplied) under the Conveyor (customer-supplied) is strongly recommended to keep the floor around the tunnel dry. A condensate return tank (customer-supplied) may be added to collect the condensate and return it to the boiler or steam generator make-up tank. Recirculating the condensate saves energy, recycles boiler chemicals, and conserves water.

Unpacking

- When opening the box, be careful not to scratch the exterior of the heat tunnel.
- Examine the unit for obvious damage.
- Check connections and tighten if needed.
- Level the unit using leveling feet.

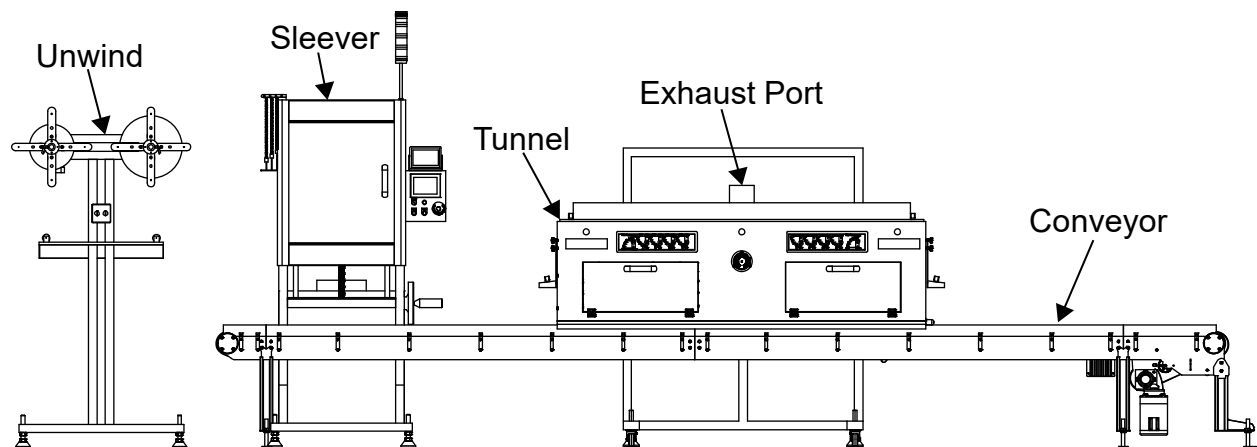
Heat Tunnel Placement

Align the heat tunnel downstream of the sleever on the same conveyor. Position the tunnel centered over the conveyor at both ends and level. The steam jets of the bottom steam manifold of Zone 1 must align with the top of the conveyor chain to precisely shrink the bottom of a full-body label and achieve a high-quality finish.

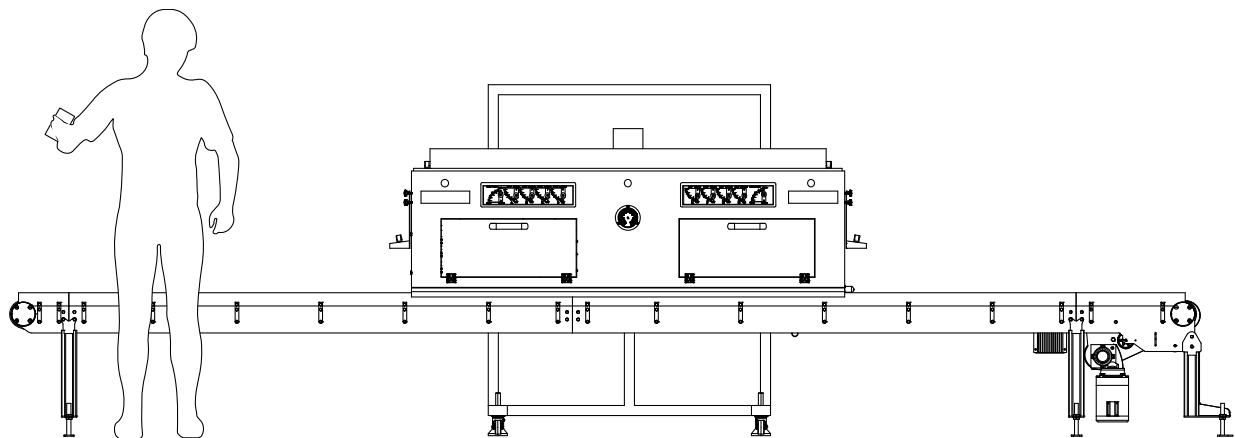
If it is not necessary to maintain labels in a specific orientation, the tunnel may be positioned beyond the first conveyor transfer. Container pitch through the sleever may be adjusted without affecting the time containers spend in the tunnel.

Ensure that all heat tunnel controls are easily accessible.

Connect the ventilation equipment, if required. Venting the exhaust ports outside of the building is recommended. Refer to the “Steam Exhaust System” section on page 14.



If not using a sleever, ensure that the operator has enough room to move and is not in danger of getting caught in moving mechanisms. Make a trip cord or other safety shutoff mechanisms available.

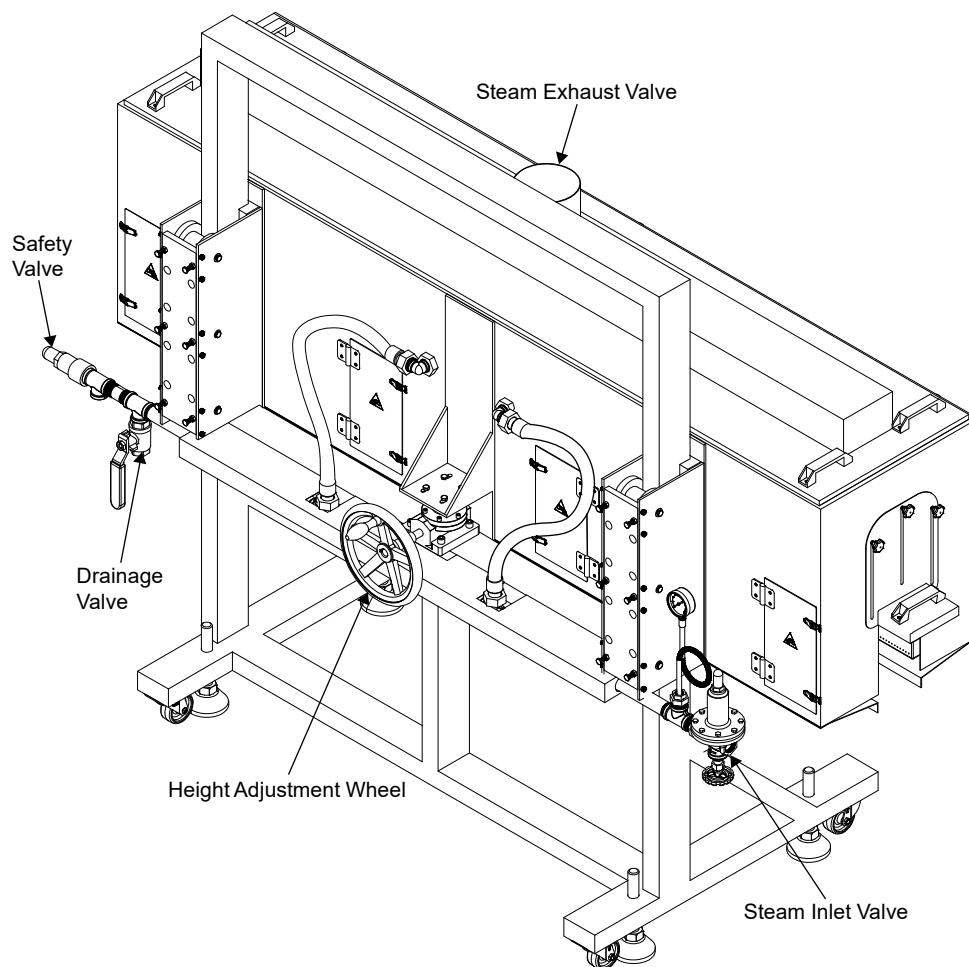


Heat Tunnel Configuration

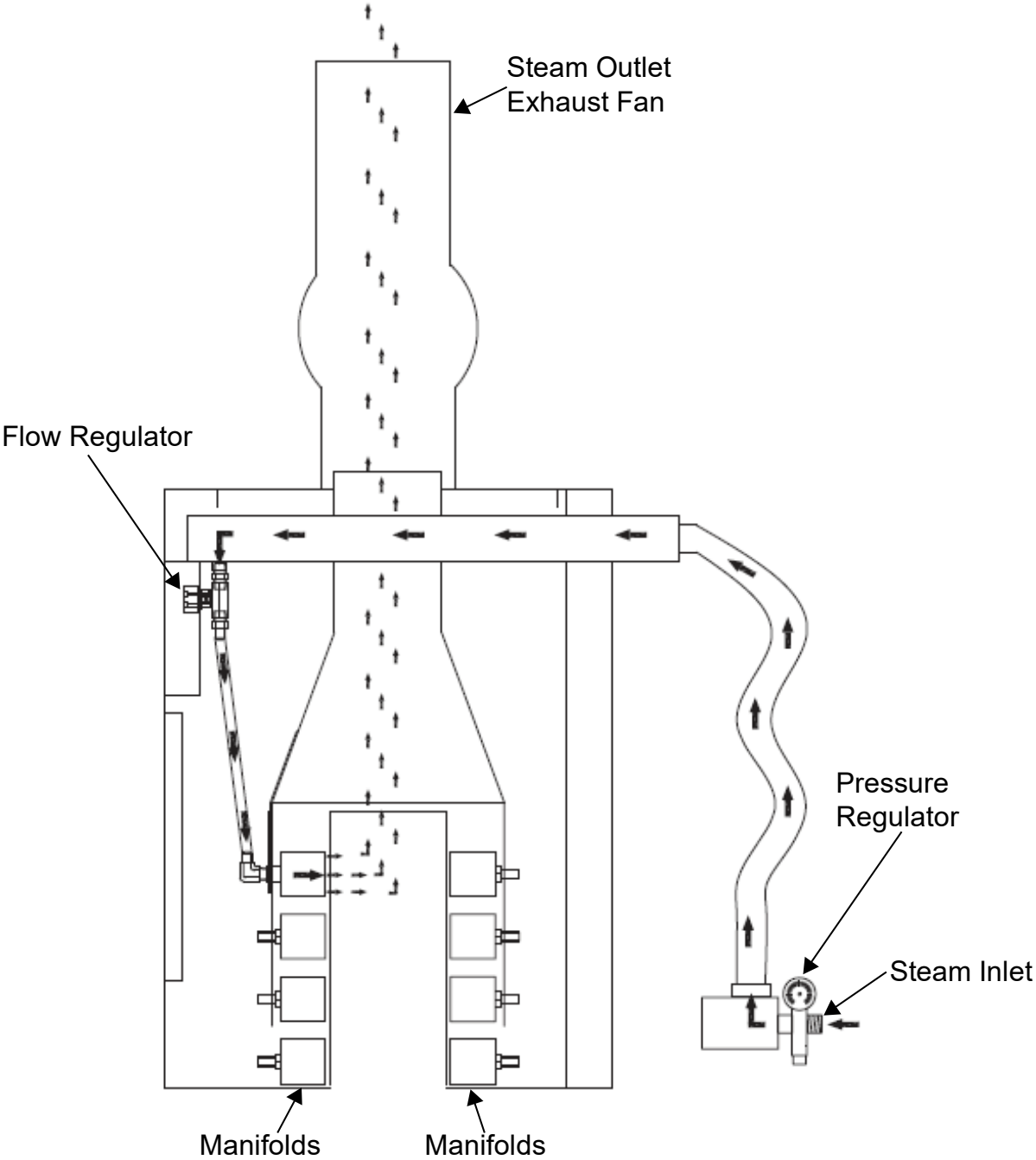
By default, the heat tunnel is configured to operate from left to right. It can be configured to operate from right to left.

Steam Valves and Connections

1. Ensure that the Steam Exhaust Valve and the Steam Inlet Valve are in the open position.
2. Ensure that the Drain Valve is in the closed position.
3. Attach the Input Steam Hose to the Steam Inlet Valve. On-site steam is required.
4. Turn the Height Adjustment Wheel to raise or lower the steam tunnel to match the conveyor height. The Zone 1, Tier D steam manifold should be positioned just above the bottom of the product.
5. Check for leaks. If found, call AFM Technical Support. Refer to the “AFM Technical Support” section on page 30.

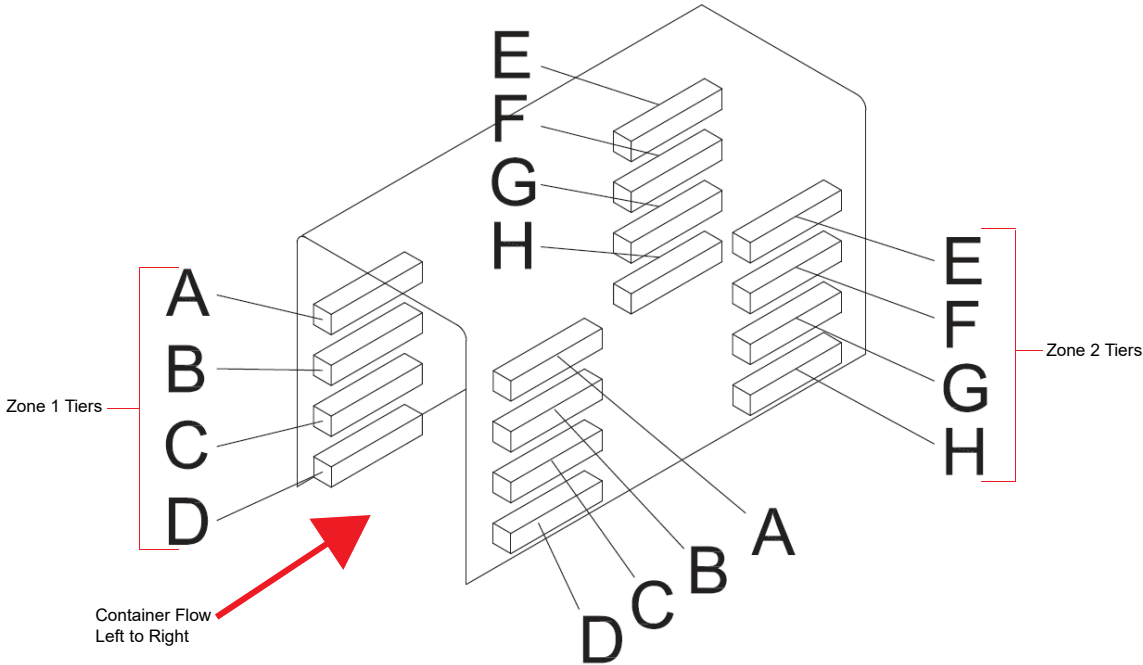


Steam Tunnel Components



Steam Manifolds

The WSN300 Steam Tunnel consists of two zones with four tiers of steam manifolds in each zone. Each tier adjusts independently using the steam flow adjustment controls at the front of each zone. Refer to the “Adjusting Steam Manifolds” section on page 20.



Drip Skirt

Drip Skirts are included with the tunnel and attached below the length of the heat chamber. Condensate drains into the Drip Skirts from the bottom of the heat tunnel chamber. The condensate is then routed toward the conveyor.

Operation

Ensure that the conveyor (customer-supplied) is equipped with a drain pan and a floor drain, bucket, or other means of draining condensation.



CAUTION: Turn off steam and allow the tunnel to cool before placing hands inside the heat chamber.

Theory of Operation

A number of factors need to be considered and adjusted to achieve the desired shrink label finish and quality.

Shrink Ratio

Steam must be directed at the labels so that they shrink in an orderly manner. Steam flow in Zone 1 of the Steam Manifold is adjusted to firmly shrink the bottom of the label to the container. The upper sections of the label that require the highest shrink ratio are shrunk in Zone 2. For example, the section of the label that adheres to a tapering or narrow bottleneck. The shrink ratio must be sufficient to pull the label into the smallest circumference of the container.

Pressure and Temperature



CAUTION: Before applying shrink label film to containers, protect it from temperatures in excess of 80 °F (27 °C) at which it begins to shrink.

Regulated pressure should be 25~35 PSIG (0.17~0.24 MPa, 1.76~2.46 KgF/cm²). The regulated pressure determines the steam temperature at the regulator and as it contacts the label. Using the minimum pressure required to achieve the desired shrink finish and quality is recommended.

The temperature gauge displays the average temperature inside the heat chamber. This reading is intended for reference only.



CAUTION: Excess steam pressure may cause shrink defects.

Label and Container Materials

Label materials must be taken into consideration when adjusting for the desired shrink finish. Some label substrates, such as PLA, require less heat than other materials. Materials such as opaque PET may require more heat.

Ink pigments may have widely varying thermal and frictional characteristics, which can affect label shrink finish.

Container materials, especially glass and aluminum, transfer heat into the container contents and can absorb heat from steam in the tunnel, reducing the amount of heat available to shrink labels. This effect is more pronounced with cold liquid in the containers.

Tunnel Startup

1. Turn steam ON.
2. Turn the Conveyor (customer-supplied) power to ON.
3. If necessary, adjust the tunnel height for the conveyor and the product.
4. Turn the Exhaust System (customer-supplied) ON.



CAUTION: Always use the Exhaust System (customer-supplied) when operating the steam tunnel.

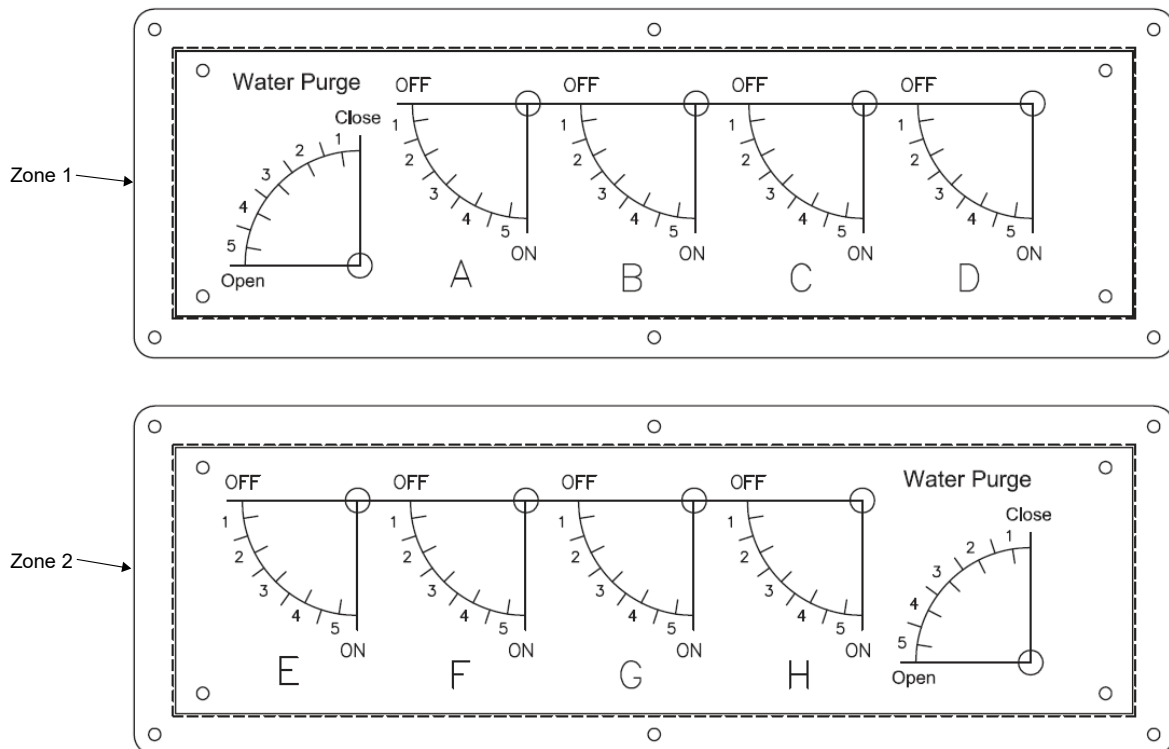
5. If necessary, open the Water Purge Valve for each zone to drain condensation from the steam manifolds.

Adjusting Steam Manifolds



CAUTION: Doors and dial adjustments may be hot when the WSN300 is operating. Use heat-resistant gloves.

Adjust the zone (1 and 2) and the tier (A-H) controls to direct steam based on the product. Applying steam to shrink the labels to the product from the bottom up is recommended.



Tunnel Shutdown

Perform this procedure at the end of each work day.

 **CAUTION:** Hot surfaces

1. Turn steam OFF.
2. Turn conveyor power OFF.

Troubleshooting

Defect	Cause	Solution
Bubbles on label after shrinkage	Insufficient heat	<ul style="list-style-type: none"> • Increase steam volume to the relevant tier. • Check regulated pressure; increase as necessary.
Label is pulling up at base of container	Insufficient heat at base of container through zone 1, compared to heat higher on container.	Increase steam volume to bottom manifold in Zone 1.
Wrinkles in center of label	Excessive liquid water suspended in steam.	<ul style="list-style-type: none"> • Open dampers • Increase exhaust fan speed
Air trapped under label	Label is shrinking simultaneously at bottom and top, trapping air in the center.	<ul style="list-style-type: none"> • Decrease the steam volume in the upper tiers of Zone 1. • Open the damper in Zone 1.
Label splitting at seam during shrinkage	Label manufacturing defect; insufficient solvent on label.	<ul style="list-style-type: none"> • Record the lot code and date from the roll core. • Keep a sample of the split label. • Inform the label manufacturer. • Use another roll of labels.

Maintenance

The AFM WSN heat tunnel requires little maintenance during normal operation.

Mounting Hardware and Connections

- Occasionally check the mounting hardware. Retighten any mounting brackets or screws that may have vibrated loose during operation.

External Cleaning

The WSN tunnel external components can be gently wiped clean with a clean cloth and cleaning spray.

Parts Lists

WSN-300 Parts List

No.	Part Number	Item	Specification	Qty
1	5B0114X203	Chain	RS40 203	1
2	5BC01KRN250+FR90	Nylon Handle Wheel	KRN250+FR90D=18M8 × 2 5 × 2.5	1
3	5BC01KRN80	Nylon Handle Wheel	KRN80 D=10 M6-2	2
4	5BC03AGS200	Bow-Type Handle	AGS200	6
5	5BC03AH110	Bow-Type Handle	AHG110	10
6	5BC4514104	Hinge	14104	6
7	5BF011B4X15T2M65	Sprocket	RS40 15T D=25 M6-2 5 × 2.5	2
8	5CF08TM03TATSL06X500	Height Adjuster	TM3TATSL1/6-500 400	2
9	5DB09SVF040	SUS Valve	SVF-40 1/2"	6
10	5DB09SVF060	SUS Valve	SVF-60 3/4"	2
11	5DB09SVF080	SUS Valve	SVF-80 1"	1
12	5DC04SBU0402	SUS Connector	SBU-0402 1/2" × 1/4"	12
14	5DC04SCN0604	SUS Connector	SCN-0604 3/4" × 1/2"	6
17	5DC04SCS0202	SUS Connector	SCS-0202 1/4" × 1/4"	24
18	5DC04SCS0606	SUS Connector	SCS-0606 3/4"H × 3/4" PT	2
19	5DC04SCS0608	SUS Connector	SCS-0608 3/4" × 1"	2
20	5DC04SLF006	SUS Connector	SLF-006 3/4" 90 degree	4
21	5DC04STF004	SUS Connector	STF-004 1/2" T	6
22	5DC04STF006	SUS Connector	STF-006 3/4" T	6
23	5DC04STF008	SUS Connector	STF-008 1" T	3
24	5Y0376X14	Steam Hose	1/4" × SSN × 700 mm	12
25	5Y0376X15	Steam Hose	1/4" × SSN × 800 mm	2
26	5Y0377X2	SUS Tube	3/4" × 350 mm	2
27	5Y0377X3	SUS Tube	1" × 500 mm	1

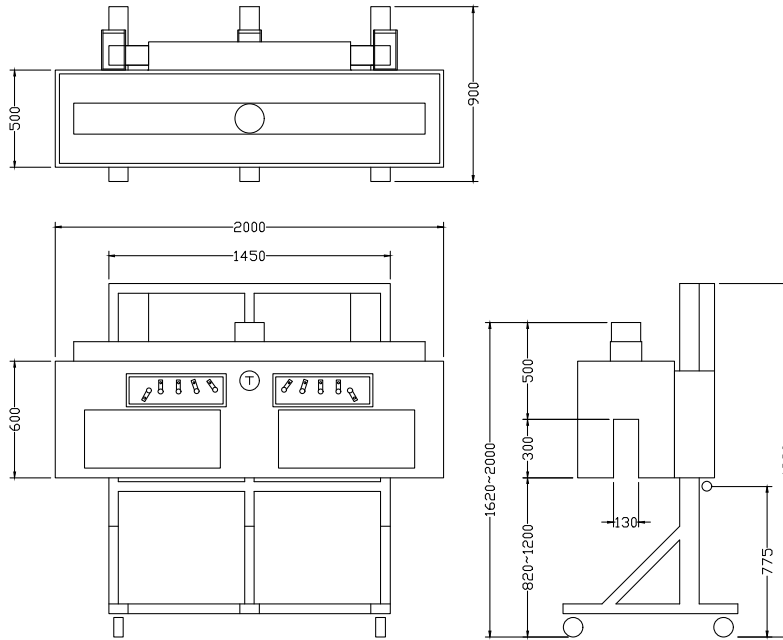
No.	Part Number	Item	Specification	Qty
28	5Y0377X6	SUS Tube	1" × 1000 mm	2
29	5Y0926X2	SUS Safety Valve	1" 7 Kg	1
30	5Y0936	Pressure Regulator	1" SVF6-080 Z-Tide	1
31	5Y0937	Temperature Gauge	3" × 0.5" × ½ × 50 mm × 200 C/F	1

Recommended Spare Parts List

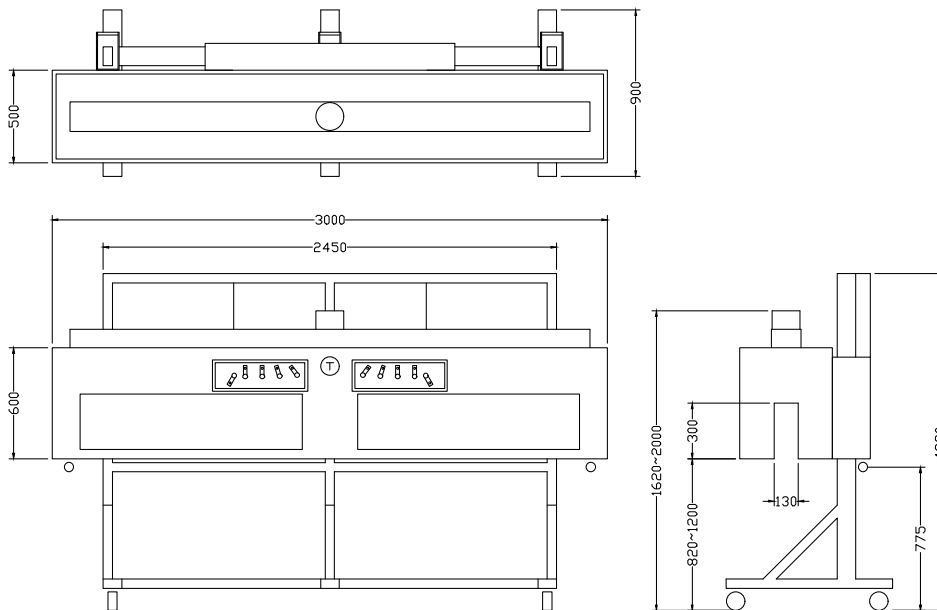
- 5Y0936 Pressure Regulator

Component Dimensions

All dimensions are shown in millimeters.



WSN300-2M



WSN300-3M

Warranty Statement

American Film & Machinery (AFM) warrants that all the products it ships will be in good working order and free from defects in material and workmanship for a period of one year from the date of shipment by AFM and will conform to the published specifications for that product.

Limitations

The warranty of AFM is contingent upon installation, operation, and maintenance of equipment under normal operating conditions. The warranty is void on equipment or parts: damaged by corrosion, improper use, accident, negligence or not operating within the specifications provided; damaged by fire, flood, earthquake, or such other causes beyond the control of AFM; that have been altered or repaired in any way changing the original performance and; that are normally expendable in the usual course of operation. Expendable items include, but are not limited to, heater elements, cutter blades and belts. The warranty period on each replacement equipment or part in fulfillment of the warranty on new equipment or parts shall be for the unexpired portion of the original warranty.

Repairs

All in-house repairs are rigorously tested for optimum operation and performance and warranted to be, under normal and proper use, free from defects in material and workmanship for a period of 90 days from the date of service.

Shrinking Quality

Shrinking quality achieved in a given application is dependent on the film, product, installation, material handling, and the maintenance provided. AFM makes no warranty that the shrinking quality achieved in an application will be the same as that achieved on a test piece in our demo facility.

Shipping Policy

Customer pays all incoming shipping charges for replacement components. If the item is defective and under warranty, AFM will pay all return shipping charges via the least costly method. If expedited shipping is desired, the customer must furnish their shipping account number and shipping fees will be charged to that account.

Exclusions

Damage due to tampering, abuse, improper adjustment, electrical interference, or the use of non-approved components will void any and all warranties by AFM and its distributors.



Warranty Verification

If you believe that a product or component may be defective and may be covered by warranty, obtain a Return Material Authorization number by contacting AFM technical support (Phone: 714-974-9006, Fax: 763-795-8867, or Email: info@afmsleeves.com). Based on the recommendation from AFM technical support, replacement components may be shipped out via UPS Ground or similar method. If expedited shipping is desired, customer must furnish their shipping account and shipping fees will be charged to that account.

Customer is required to return the defective component to AFM. If, after 30 days, AFM has not received the defective component, the customer will be invoiced for the replacement component. If the returned component is found to not be eligible for warranty, AFM will contact the customer, and the customer will be invoiced for the replacement component.

Warranty Eligibility

The warranty provided by AFM is only to the original buyer.

Limited Warranty

THIS WARRANTY SHALL NOT APPLY IF ANY MODIFICATION, ALTERATION OR ADDITION IS MADE TO THE PRODUCT WITHOUT AFM'S PRIOR WRITTEN APPROVAL. FURTHERMORE, THIS WARRANTY DOES NOT APPLY TO PRODUCT DEFECTS DUE TO MISUSE, ABUSE, NEGLIGENCE, OR FAILURE TO FOLLOW RECOMMENDED PROCEDURES. ANY PRODUCT REPAIRED OR ALTERED BY PERSONS OTHER THAN AUTHORIZED AFM REPRESENTATIVES WILL NOT BE COVERED BY THIS WARRANTY. THIS WARRANTY DOES NOT APPLY TO CONSUMABLE ITEMS.

EXCEPT AS EXPRESSLY PROVIDED IN THIS WARRANTY, AFM MAKES NO REPRESENTATION OR WARRANTY, EXPRESSED OR IMPLIED, WITH RESPECT TO THE PRODUCT, INCLUDING, WITHOUT LIMITATION, ANY WARRANTY AS TO MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, NON-INFRINGEMENT OR ANY OTHER MATTER.

AFM SHALL HAVE NO LIABILITY TO ANY PERSON FOR INCIDENTAL, CONSEQUENTIAL, OR SPECIAL DAMAGES OF ANY DESCRIPTION WHETHER ARISING OUT OF WARRANTY OR OTHER CONTRACT, NEGLIGENCE OR OTHER TORT, OR OTHERWISE. NO AGENT, EMPLOYEE, OFFICER OR OTHER REPRESENTATIVE OF AFM, INC. HAS AUTHORITY TO BIND AFM TO ANY REPRESENTATION OR WARRANTY EXCEPT AS STATED HEREIN. UNDER NO CIRCUMSTANCES SHALL AFM'S LIABILITY HEREUNDER, FOR ANY REASON OR CAUSE EXCEED THE PRICE PAID TO AFM FOR THE PRODUCT.



Disclaimer of Damages

REGARDLESS OF WHETHER ANY REMEDY SET FORTH HEREIN FAILS OF ITS ESSENTIAL PURPOSE, IN NO EVENT WILL AFM BE LIABLE FOR ANY SPECIAL, CONSEQUENTIAL, INDIRECT OR SIMILAR DAMAGES, INCLUDING LOST PROFIT OR LOST OPPORTUNITIES OF ANY TYPE ARISING OUT OF THE USE OR INABILITY TO USE THESE PRODUCTS EVEN IF AFM HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

AFM Technical Support

For help installing or operating the AFM WSN300 Steam Tunnel, contact your authorized AFM reseller or AFM Technical Support.

Phone: 714-974-9006

Fax: 763-795-8867

Email: info@afmsleeves.com

Web: www.afmsleeves.com

Thank you for your purchase of AFM products. We are pleased to be a part of your Shrink Sleeving Applications.

