

# **Provel T6**

## **Thermoformer**

### **User's Guide**

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# Introduction

The Provel T6 Thermoformer is a fully automated prosthetic limb socket forming machine designed to use industry standard socket preforms. The T6 is constructed of stainless steel and features a high efficiency oven, built-in clamp ring and table storage, and an illuminated forming area. Clamp rings and tables are provided for 16, 18, and 25 cm preforms. The T6 monitors door position, carriage position, oven temperature, oven over-temperature, drive motor load, drive speed, and vacuum system function. Carriage travel can only occur when the door is closed.

# Precautions

Always wear protective gloves when handling hot preforms or clamp rings. Never remove access panels or attempt to service the thermoformer without disconnecting electrical power. Read the entire user's guide carefully before using the thermoformer. It is the responsibility of the user to ensure that adequate ventilation is provided for operation of the thermoformer. The use of unapproved preforms can cause damage to the thermoformer, may create a health hazard, and will void the warranty.

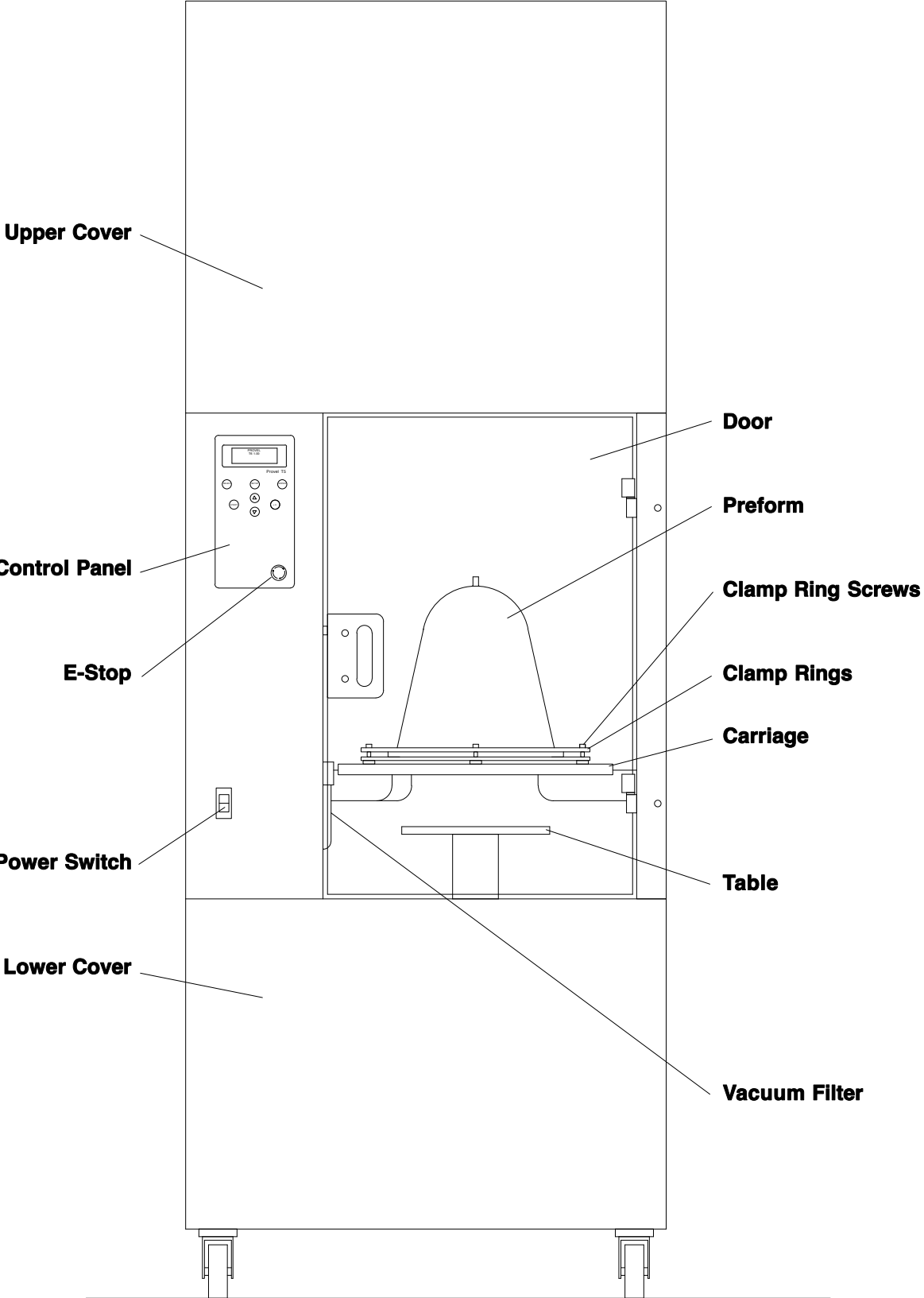
# Cleaning

Detergent based spray cleaners can be used to clean exterior surfaces. The acrylic door can be cleaned with a clean, soft cloth and a solution of detergent in water. Do not use solvents or abrasive cleansers.

# Maintenance

The lead screws must be kept clean and well lubricated with the grease supplied with the machine. Never operate the carriage with dry lead screws. If vacuum is weak at the forming table, clean the filter. Disconnect power, unscrew filter bowl, unscrew filter element, clean filter, empty bowl, and reassemble. Never remove any access panel without disconnecting power.

# T6 Thermoformer



# Operation

## Operation Summary

Turn power on.  
Select preform.  
Load preform, close door.  
Press start. Preform will move to oven after preheat.  
Load pattern, close door.  
Remove socket and pattern.

## Manual Motion

Press UP or DOWN arrow keys to raise or lower the carriage. The carriage automatically stops at the end of travel limits. The carriage will not move unless the door is closed. Pressing UP or DOWN during automatic operation will cancel the forming cycle and require restarting with an unheated preform.

## Oven Preheating

The oven must reach the set temperature before a thermoforming cycle can begin. This will normally require 8-10 minutes when starting from room temperature.

## Changing Preform Settings

It may be necessary to change the factory time settings to compensate for local conditions or processing variations from batch to batch of preforms. Times from 10.0 to 30.0 minutes may be set.

## Thermoforming

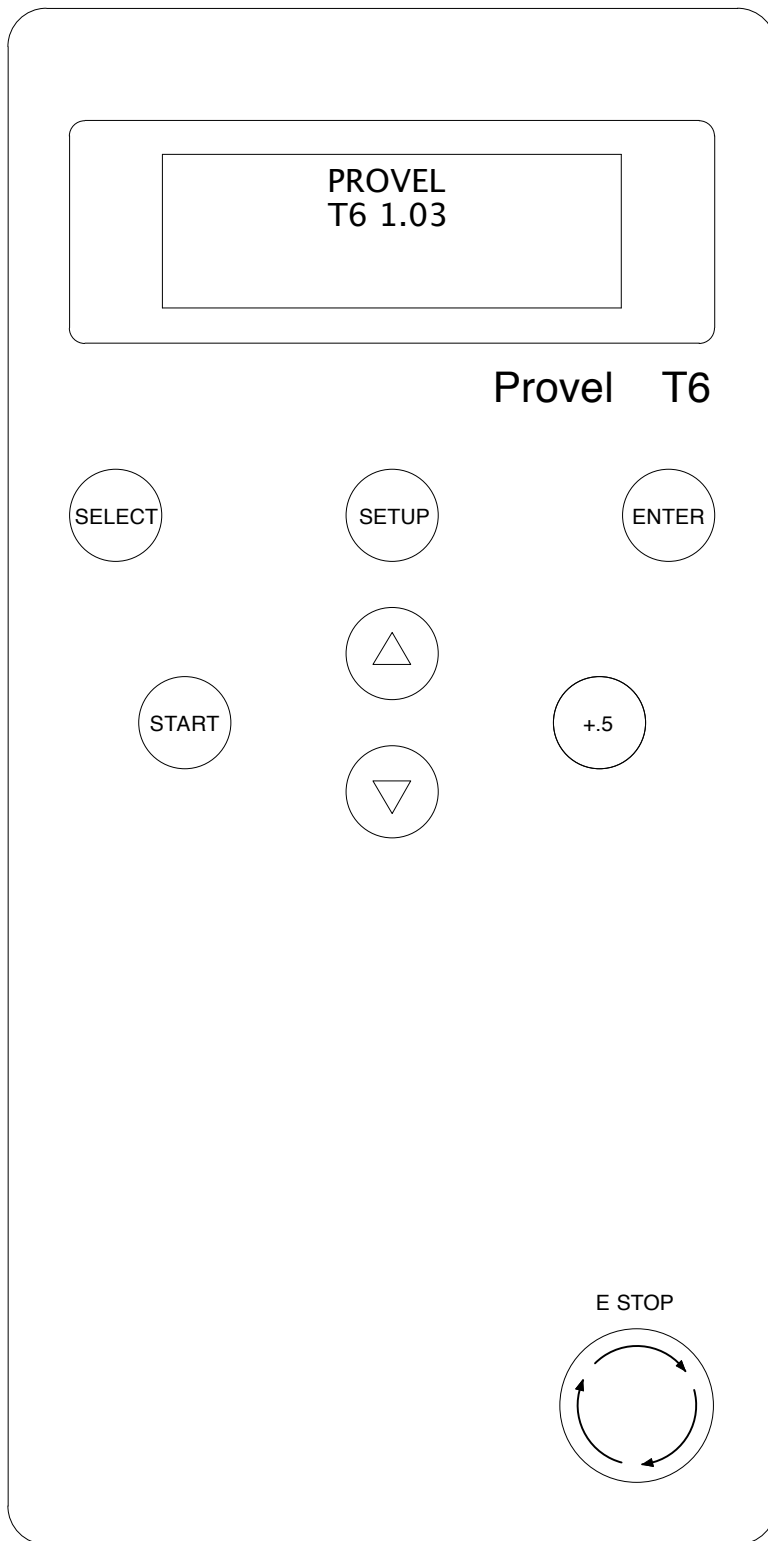
Press START to begin an automatic thermoforming cycle. The cycle will not start if the door is open, or if the oven has not reached the set point. The display will show preform, heat time, temperature, and vacuum. The vacuum pump will start when the timer reaches 1.0 minutes, and will continue for 7 minutes after forming. At 0.0 minutes, the carriage will move down to forming position. After a 1 second or other selected delay, the vacuum valve will open, and the vacuum timer will start. Press E-STOP to stop carriage motion, vacuum, and turn the oven off. Pressing E-STOP during automatic operation will cancel the forming cycle and require starting over with a transform at room temperature. If the carriage is unable to move to forming position because the door is open, an alert will sound and the oven will shut off. Oven temperatures over 235°C will cancel the forming cycle and require starting over with a transform at room temperature.

## Early And Late Forming

The forming sequence can be started before the preset time has elapsed by pressing START. Press +.5 to add a half minute to the heat time. The actual time used will appear on the display at the end of each forming cycle.

# Status Messages

CLOSE DOOR	Door must be closed for carriage motion.
RELEASE E STOP	Stop must be released for carriage motion.
PROCESS STOPPED	Stop pressed or automatic operation canceled.
DRIVE FAULT	Drive error detected.
OVER TEMP FAULT	Oven temperature has exceeded 235°C.



## Control Panel

**SELECT** : Select preform or value.

**SETUP** : Edit preform time, temp, reset defaults, or adjust display.

**ENTER** : Accept entry, return to idle screen.

▲ : Move carriage up, change value in Setup.

▼ : Move carriage down, change value in Setup.

**START** : Start auto cycle, Go Now after preform reaches oven.

**+.5** : Add .5 heat time.

**E-STOP** : Twist to release.

```

SELECT PREFORM
TEMP 25C
(SELECT)      (SETUP)

```

**Idle Screen**

Press SELECT to choose preform. TEMP is current oven temperature. Bottom line displays key press options.

```

PREFORM      VAC DELAY
18NAT        1 SEC
^^
(SELECT) ( ^v ) (SETUP)

```

**Select Preform**

Press SELECT to move cursor. Use Up, Down arrow keys to change value. Vac Delay allows 1, 5, or 9 second vacuum onset delay for manual manipulation of preform on model before vacuum is applied.

```

PFM  DLY TIME  STPT
18NAT 1   21.0  220C
TEMP  25C
(START) (SELECT) (SETUP)

```

**Ready**

Press START to preheat oven and begin automated forming cycle.

```

PFM  DLY TIME  STPT
18NAT 1   21.0  220C
TEMP  183C
PREHEATING OVEN

```

**Auto Cycle Preheating**

After oven reaches temperature, Preform moves to oven and timer counts down. If door is left open, alarm will sound to prompt user.

PFM	DLY	TIME	STPT
18NAT	1	21.0	220C
		TEMP	220C
		LOAD MODEL	

**Auto Cycle Heating Preform**  
 Oven time counts down.  
 With 5 minutes remaining,  
 display prompts user to load  
 model if the door has not been  
 opened and closed.

PFM	DLY	TIME	STPT
18NAT	1	1.0	220C
VAC	0.0	TEMP	220C
(START)	now		(+.5)

**Auto Cycle Heating Preform**  
 Vacuum pump starts with one  
 minute remaining. Press +.5 to  
 extend heat time. Press START  
 to start forming cycle now.

PFM	DLY	TIME
18NAT	Ø	6.9
VAC	27.0	
	FORMING	

**Auto Cycle Forming**  
 Time will show vacuum time  
 remaining.

PFM	TIME	TEMP
18NAT	21.0	220C
	^^ ^	
(SELECT)	( ^v )	(SETUP)

**Setup**  
 Press SETUP to change time,  
 temp or set Backlight and  
 Display Contrast. Pressing  
 SETUP advances thru editable  
 settings and default reset  
 options.

CLOSE DOOR  
MOVE CARRIAGE TO  
HOME POSITION  
( ^ v ) (ENTER)

### Home Carriage

If carriage has been moved from home after cycle completion, it must be returned to home before beginning an automated cycle.

18NAT  
ACTUAL HEATING TIME  
23.4  
(ENTER) (SETUP)

### Modified Heating Time

Displays actual heat time used if modified with +.5 key or pressing START to begin forming before end of heat time.

RESET PREFORM 18NAT  
TO FACTORY DEFAULTS  
(START) TO RESET  
(SETUP) (ENTER)

### Reset Factory Defaults

From Idle or Ready screen, press SETUP twice to reach screen allowing factory default time and temp to be restored for selected preform. Press SETUP from this screen to reach screen allowing defaults to be restored for all preforms.

0123456789ABC  
000000001001  
TEMPERATURE 114.7C  
VACUUM 0.0

### Test Mode

Displays status of switches, temp, and vacuum.



# Preforms & Models

## Preform Selection

Socket preforms are available in 16, 18, and 25 cm sizes. Size the preform for the smallest table which will accommodate the pattern. Use of a larger preform than necessary will increase the tendency for webbing during vacuum forming. Do not reheat preforms that have already been formed. A stretched preform can be long enough to damage the fan when entering the oven.

## Preform Draw Length

Size (cm)	16	18	25
Minimum Draw Length (mm)	340	350	450

## Preform Loading

Install the appropriate table for the pattern to be formed, and secure the preform to the carriage with the matching clamp rings. Using a preform that does not match the table selected can damage the machine.

Take care to center the preform in the upper clamp ring for table alignment. Clamp ring adjustment screws should be adjusted to allow full rotation of the upper clamp ring to the ends of the keyhole slots with light pressure on the preform. Adjust the screws if necessary. Close the door.

## Models

Polyurethane foam or plaster patterns can be used. A nylon or stockinette sheath applied to plaster patterns will help avoid air entrapment. The pattern should not overhang the table, or the pattern may shift or be damaged as the carriage descends, and the transform may not seal to the table for vacuum forming.

## Model Loading

Adjusting the pattern to achieve sufficient draw length and angulation of the pattern to minimize reentrant features of the pattern will reduce the tendency for webbing. Length and angle adjustment can be accomplished with spacers of pattern material if necessary. The spacer should be of slightly smaller diameter than the pattern. If the spacer is too small it may cause excessive thinning of the transform and subsequent perforation and loss of vacuum. Center the pattern on the table.

If the door has not opened and closed during the heating cycle when 5 minutes remain in the set time, a pattern loading reminder alert will sound at 1 minute intervals until the door is opened and closed. If the set time has elapsed and the door has not been opened and closed, the preform will descend from the oven to loading position, but no vacuum will be drawn.

# Troubleshooting

## **Preform Webbing**

Raise the model on the table 1 or 2 inches.  
Use smallest possible preform diameter.  
Adjust pattern angulation to minimize reentrant features.  
Add heating time or increase temperature slightly.  
Flare the proximal end of the pattern before carving.

## **Preform Thinning**

Use a larger preform.  
Reduce draw length.

## **Vacuum Loss**

Use a larger diameter spacer below pattern to avoid excessive thinning if perforation occurs in this area.  
Smooth any sharp edges that may perforate the preform.

## **Poor Vacuum**

Ensure the preform is heated enough to allow the carriage to reach the lower limit switch for a good seal to the forming table.  
Confirm the correct table is installed .  
Check for obstructions at the table vacuum inlet.  
Clean vacuum filter.

## **Cold Preform**

Confirm that temperature and time settings are correct.  
Increase heating time as necessary.

## **Collapsed Preform**

Confirm that temperature and time settings are correct.  
Decrease time as necessary.  
A collapsed preform should be removed from the clamp rings before it cools into a shape that may make removal difficult.  
Always wear gloves when handling hot materials.

## **No Carriage Motion**

The door must be closed for carriage motion.  
Make sure the E-Stop switch is not pressed.  
If a preform stalls the carriage, move the carriage away from the pattern, and remove the pattern. If the carriage remains stalled when manual motion is attempted, turn the power off and remove the preform. It may be necessary to loosen or remove the clamp ring screws.  
Always wear gloves when handling hot materials.  
If the carriage drive motor will not run after obstructions are cleared, disconnect the power and remove the lower cover to for access to the carriage motor overload control.  
Press the blue Reset button on the overload unit.

## **Carriage Noise**

Lubricate carriage drive screws with lubricant supplied.  
Adjust carriage drive nut set screws if loose.

# Default Settings

Preform Size	Time	Temperature
CHK 16	14	170C
BLK 16	25.5	220C
NAT 16	26	220C
CHK 18	12	170C
BLK 18	19.5	220C
NAT 18	20	220C
CHK 25	13.5	170C
BLK 25	23.5	220C
NAT 25	24.5	220C
CHK 28	14.5	170C
BLK 28	24.5	220C
NAT 28	25.5	220C

# Specifications

Overall Size	66 x 80 x 216 cm (26 x 31.5 x 85 in)	
Minimum Ceiling	224 cm (88 in)	
Weight	182 kg (400 lbs)	
Power	230 VAC 15A, 50/60 Hz	
Capacity	25 cm diameter x 60 cm (9.7 in diameter x 23.5 in)	
Preform Sizes	16, 18, 25 cm	
Oven	230° C Max	
Vacuum	27 in Hg	
Fuses	Vacuum Pump	FNM-4
	Fan	FNM-4
	Valve	GMC-1

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# Schematic

