MACHINE SOLUTIONS INC.

USER MANUAL

BEAHM DESIGNS

Tube Flare 120 Model

BEAHM DESIGNS

Machine Solutions Inc. 2951 W. Shamrell Blvd. Flagstaff, Arizona 86005 USA
Tel: 928.556.3109 • Fax: 928.556.3084
info@machinesolutions.com • www.machinesolutions.com

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Product images are representative of standard equipment offerings and may differ from delivered equipment.

Welcome

Machine Solutions, Inc. (MSI) would like to take this opportunity to thank you for purchasing your new TF-120 Tube Flaring machine. At MSI, we are dedicated to bringing innovative process development solutions to both medical device and nonmedical organizations. MSI looks forward to helping your organization provide life-improving devices to your customers, today and tomorrow.

Purpose

The purpose of this document (*Original Instructions)* is to describe the control system for the Tube Flaring machine, TF120 model.

Overview

The Beahm Designs Inc. Model TF120 is a system designed to accommodate interchangeable tip sizes. This unit allows you to flare or expand the ID of PTFE sheaths, and other thermoplastic tubings and is equipped with a foot pedal actuated cooling line to set the shape in the material. Thermocouple feedback ensures stable temperature set points.

Installation

NOTE: Ensure the system power switch is in the off position

1. Place the system on a level, sturdy surface.
2. Connect the system air extension line to 80—100 psi clean dry compressed air source.
3. Connect main AC power to the power entry module on the rear panel.

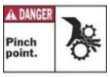
Safety

NOTE: See Maintenance section for facilities requirements

- Place the system on a level, sturdy surface at an ergonomically viable height for the user.
- Use of eye protection when working with compressed gases and heated materials is advised.
- The maximum observed Sound Pressure Level is below 70 dB(A).
- Tips will become hot during operation and, depending on temperature set point, can cause severe skin burns if contact occurs.

CAUTION: High voltage. Remove power and use safety precautions when servicing.

CAUTION: Hot surface. Contact may cause burn. Allow to cool before servicing.



CAUTION: Pinch point. Keep hands and body parts clear while in operation.

User Alerts

Do not use the equipment other than as prescribed. Examples: Do not attempt to sit on or climb on the equipment, do not place heavy objects or containers of liquid on the machine, do not to insert any foreign objects into the machine and do not attempt to bypass any guards or otherwise operate the machine in any manner other than that in which it is explicitly intended.

NOTE: The equipment is not for use with materials that can decompose or ignite below the maximum operating temperature of the machine. Hazards are materials that outgas hazardous substances and or ignite. (260°C/500°F).

NOTE: This equipment is not for use in an ATEX environment.

Controls and Features

Located on the front and rear panels are the following controls and/or displays and their function.

Description	Function
System Power Switch	Toggles system power on and off
Temperature Controller	Controls the air temperature
Cooling Air Line	Cools product after processing
Cooling Air Flow Adjust	Controls cooling air flow rate
Cooling Air Toggle Switch	Toggles cooling air on/off

Maintenance

CAUTION: Pinch point/crush hazard. Keep fingers, hands, and clothing clear of moving parts.

1. Use 99% isopropyl alcohol to wipe down the outside of the machine. Do not attempt to clean the inside of the machine. Machine should not be washed down.
2. Cleaning should be with a soft dry cloth only.

CAUTION: Hot surface. Contact may cause burn. Allow to cool before servicing.
NOTE: Ensure the machine is unplugged for any servicing or maintenance work.

CAUTION: Ensure the conical tip cooled to within 15 degrees F of ambient temperature before proceeding with replacement.

Flare Tip Replacement

1. Grasp the conical tip and rotate counterclockwise (standard threads) to remove the tip.
2. Install replacement tip by threading it onto the heater post.

System Operations

WARNING: Avoid skin contact with the flare tip as injury may occur.

Operation

- Switch Main Power on.
- Set desired die temperature in degrees F using the instructions listed below.
- Position component to be processed at the center of the tip of the flare tool press tubing onto tool until the desired amount of flare is achieved then depress the foot pedal or toggle the cooling air switch briefly to cool and set shape.
- Upon completion of flare, remove the product from the flare tooling.

Temperature Controllers (Omega Platinum Model)

Please note, the Omega temperature controller has been auto tuned and is set for optimal performance. Contact Beahm Designs for further diagnostics and instructions.

PID Configuration (PRoG > PId.S)

	Navigate to the desired setting. Settings include the following: • ACtN – Action direction moves up or down to SP1. • A.to – Autotuning Timeout sets a maximum amount of time for Autotuning. • AUto – Initiates Autotuning • GAIN – Select the proportional, integral, and derivative factors for manual tuning. • %Lo – Low clamping limit for Pulse and Analog outputs • %HI – High clamping limit for Pulse and Analog outputs • AdPt – Fuzzy logic adaptive tuning
	Select the desired parameter.

Action Response (PRoG > PId > ACtN)

	Select the Direction (ACtN) parameter.
	Navigate to the desired setting. Settings include the following: • RVRS – “Reverse Action”: Increase to SP1, such as heating (factory default) • dRCt – “Direct Action”: Decrease to SP1, such as cooling • RVRS/dRCt – Increase or Decrease to SP1, such as heating/cooling
	Select the indicated setting.

Autotune Timeout (PRoG > PId > A.to)

	Select the Autotune Timeout (A.to) parameter.
	Set the amount of time before the Autotune process gives up and times out in Minutes and Seconds (MM.SS). Slowly responding systems should have a longer time-out setting.
	Select the indicated setting.

Autotune (PRoG > PId > TUNE)

	Select the Autotune (AUto) command. The unit displays StRt.
	Confirm Autotune activation. The unit attempts to optimize the P, I, and d settings by stimulating the system and measuring the response. If the A.to time out period expires before the Autotune operation can complete, the unit displays a failure message E007. If the Autotune operation completes successfully, the unit displays the message “doNE” and the Run mode is switched to IDLE.

The Autotune function will select the tuning algorithm depending on the stability of current process and the error difference between current process and the Control Setpoint (SP1). If the process is relatively stable (i.e: at room temperature), a bump test will be performed to determine the plant characteristics.

If the process is hot, or if the process is within 10% of Control Setpoint, limit cycle oscillation will be performed with the tuning setpoint taken at the process value when the Autotune function is triggered. Autotuning may be performed as many times as needed or when the operating conditions (i.e: process load, or setpoint) have changed significantly. To obtain good tuning results, ensure the process is stable prior to triggering autotune function. The process is stable when it is at ambient temperature, or it is tracking Control Setpoint (SP1) in auto mode.

Adjusting Temperature on Controllers (Omega Platinum Model)

1. Press the right arrow button one time until “SP-1” is displayed.
2. Press the enter button to access the temperature screen.
3. Use the left and right arrow buttons to set desired temperature.
4. Once the desired temperature is set, press the enter button to return to the main screen. Heaters ramp to correct temperature.

Temperature Controller Layout and Description of Button Actions

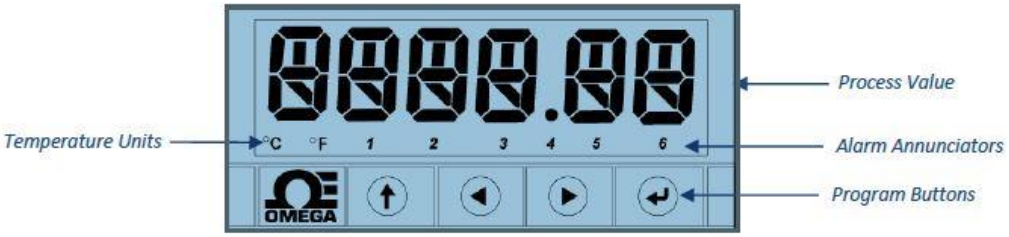


Figure 1. Controller Layout

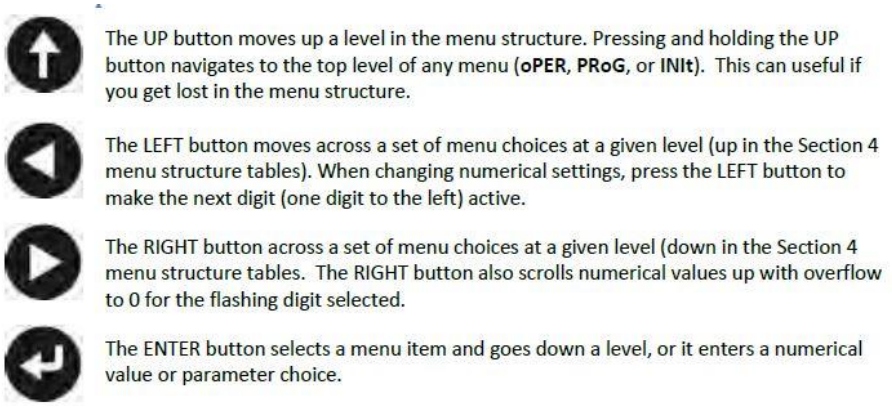


Figure 2. Description of Button Actions

NOTE: For a more detailed look at the complete menu structure, please refer to the following pages. A full description of features can be found here: https://assets.omega.com/manuals/M5451.pdf.

Resetting the temperature controller

NOTE: Press ‘↑’ to select the operator menu (Oper)
NOTE: See the following chart for the correct settings for the Beahm TF-120. Settings to change in RED.

1. Initialization Mode Menu (INIt)
   a. The following table maps the Initialization Mode (INIt) navigation:

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
INPt	t.C.	k					Type K thermocouple
		J					Type J thermocouple
		t					Type T thermocouple
		E					Type E thermocouple
		N					Type N thermocouple
		R					Type R thermocouple
		S					Type S thermocouple
		b					Type B thermocouple
		C					Type C thermocouple
	Rtd	N.wIR	3 wI				3-wire RTD
			4 wI				4-wire RTD
			2 wI				2-wire RTD
		A.CRV	385.1				385 calibration curve, 100 Ω
			385.5				385 calibration curve, 500 Ω
			385.t				385 calibration curve, 1000 Ω
			392				392 calibration curve, 100 Ω
			391.6				391.6 calibration curve, 100 Ω
	tHRM	2.25k					2250 Ω thermistor
		5k					5000 Ω thermistor
		10k					10,000 Ω thermistor
	PRoC	4–20					Process input range: 4 to 20 mA
			Note: This Manual and Live Scaling submenu is the same for all **PRoC** ranges.				
			MANL	Rd.1	____		Low display reading
				IN.1	____		Manual input for Rd.1
				Rd.2	____		High display reading
				IN.2	____		Manual input for Rd.2
			LIVE	Rd.1	____		Low display reading
				IN.1	____		Live Rd.1 input, ENTER for current
				Rd.2	____		High display reading
				IN.2	____		Live Rd.2 input, ENTER for current
		0–24					Process input range: 0 to 24 mA
		+-10					Process input range: -10 to +10 V
			Note: +- 1.0 and +-0.1 support SNGL, dIFF and RtIO **tYPE**				
		+-1	tYPE	SNGL			Process input range: -1 to +1 V

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
				dIFF			Differential between AIN+ and AIN-
				RtLO			Ratiometric between AIN+ and AIN-
		+-0.1					Process input range: -0.1 to +0.1 V
			Note: The +- 0.05 input supports dIFF and RtIO **tYPE**				
		+-.05	tYPE	dIFF			Differential between AIN+ and AIN-
				RtLO			Ratiometric between AIN+ and AIN-
							Process input range: -0.05 to +0.05 V
tARE	dSbL						Disable tARE feature
	ENbL						Enable tARE on oPER menu
	RMt						Enable tARE on oPER and Digital Input
LINR	N.PNt	____					Specifies the number of points to use
			Note: The Manual / Live inputs repeat from 1..10, represented by *n*				
	MANL	Rd.*n*	____				Low display reading
		IN.*n*	____				Manual input for Rd.*n*
	LIVE	Rd.*n*	____				Low display reading
		IN.*n*	____				Live Rd.*n* input, ENTER for current
RdG	dEC.P	FFF.F					Reading format -999.9 to +999.9
		FFFF					Reading format -9999 to +9999
		FF.FF					Reading format -99.99 to +99.99
		F.FFF					Reading format -9.999 to +9.999
	°F°C	°C					Degrees Celsius annunciator
		°F					Degrees Fahrenheit annunciator
		NoNE					Turns off for non-temperature units
	d.RNd	____					Display Rounding
	FLtR	8					Readings per displayed value: 8
		16					16
		32					32
		64					64
		128					128
		1					2
		2					3
		4					4
			Note: Four digit displays offer 2 annunciators, Six digit displays offer 6				
	ANN.*n*	ALM.1					Alarm 1 status mapped to "1"
		ALM.2					Alarm 2 status mapped to "1"
		oUt#					Output state selections by name
	NCLR	GRN					Default display color: Green
		REd					Red

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
		AMbR					Amber
	bRGt	HIGH					High display brightness
		MEd					Medium display brightness
		Low					Low display brightness
ECtN	5 V						Excitation voltage: 5 V
	10 V						10 V
	12 V						12 V
	24 V						24 V
	0 V						Excitation off
CoMM	USb						Configure the USB port
		Note: This **PRot** submenu is the same for USB, Ethernet, and Serial ports.					
		PRot	oMEG	ModE	CMd		Waits for commands from other end
					CoNt	____	Transmit continuously every ###.# sec
				dAt.F	StAt	No	
						yES	Includes Alarm status bytes
					RdNG	yES	Includes process reading
						No	
					PEAk	No	
						yES	Includes highest process reading
					VALy	No	
						yES	Includes lowest process reading
					UNIt	No	
						yES	Send unit with value (F, C, V, mV, mA)
				_LF_	No		
					yES		Appends line feed after each send
				ECHo	yES		Retransmits received commands
					No		
				SEPR	_CR_		Carriage Return separator in **CoNt**
					SPCE		Space separator in **CoNt** Mode
			M.bUS	RtU			Standard Modbus protocol
				ASCI			Omega ASCII protocol
		AddR	____				USB requires Address
	EtHN	PRot					Ethernet port configuration
		AddR	____				Ethernet "Telnet" requires Address
	SER	PRot					Serial port configuration
		C.PAR	bUS.F	232C			Single device Serial Comm Mode
				485			Multiple devices Serial Comm Mode
			bAUd	19.2			Baud rate: 19,200 Bd

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
				9600			9,600 Bd
				4800			4,800 Bd
				2400			2,400 Bd
				1200			1,200 Bd
				57.6			57,600 Bd
				115.2			115,200 Bd
			PRty	odd			Odd parity check used
				EVEN			Even parity check used
				NoNE			No parity bit is used
				oFF			Parity bit is fixed as a zero
			dAtA	8bIt			8 bit data format
				7bIt			7 bit data format
			StoP	1bIt			1 stop bit
				2bIt			2 stop bits gives a "force 1" parity bit
		AddR	____				Address for 485, placeholder for 232
SFty	PwoN	RSM					RUN on power up if not previously faulted
		wAIt					Power on: **oPER** Mode, ENTER to run
		RUN					RUN's automatically on power up
	RUN.M	dSbL					ENTER in **Stby, PAUS, StoP** runs
		ENbL					ENTER in modes above displays RUN
	SP.LM	SP.Lo	____				Low Setpoint limit
		SP.HI	____				High Setpoint limit
	SEN.M						Sensor Monitor
		LPbk	dSbL				Loop break timeout disabled
			ENbL				Loop break timeout value (MM.SS)
		o.CRk	ENbl				Open Input circuit detection enabled
			dSbL				Open Input circuit detection disabled
		E.LAt	ENbl				Latch sensor error enabled
			dSbL				Latch sensor error disabled
	OUT.M						Output Monitor
		oUt1					**oUt1** is replaced by output type
			o.bRk				Output break detection
				dSbL			Output break detection disabled
				ENbl	P.dEV	____	Output break process deviation
					P.tME	____	Output break time deviation
		oUt2					**oUt2** is replaced by output type
		oUt3					**oUt3** is replaced by output type
		E.LAt	ENbl				Latch output error enabled

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
			dSbL				Latch output error disabled
t.CAL	NoNE						Manual temperature calibration
	1.PNt						Set offset, default = 0
	2.PNt	R.Lo					Set range low point, default = 0
		R.HI					Set range high point, default = 999.9
	ICE.P	ok?					Reset 32°F/0°C reference value
		dSbL					Clears the ICE.P offset value
SAVE	____						Download current settings to USB
LoAd	____						Upload settings from USB stick
VER.N	1.00.0						Displays firmware revision number
VER.U	ok?						ENTER downloads firmware update
F.dFt	ok?						ENTER resets to factory defaults
I.Pwd	No						No required password for **INIt** Mode
	yES	____					Set password for **INIt** Mode
P.Pwd	No						No password for **PRoG** Mode
	yES	____					Set password for **PRoG** Mode

2. Programming Mode Menu (PRoG)
   a. The following table maps the Programming Mode (PRoG) navigation:

Level 2	Level 3	Level 4	Level 5	Level 6	Notes
SP1	____				Process goal for PID, default goal for **oN.oF**
SP2	ASbo				Setpoint 2 value can track **SP1**, **SP2** is an absolute value
	dEVI				**SP2** is a deviation value
ALM.1	*Note:* This submenu is the same for all other Alarm configurations.				
	tyPE	oFF			ALM.1 is not used for display or outputs
		AboV			Alarm: process value above Alarm trigger
		bELo			Alarm: process value below Alarm trigger
		HI.Lo.			Alarm: process value outside Alarm triggers
		bANd			Alarm: process value between Alarm triggers
	Ab.dV	AbSo			Absolute Mode; use **ALR.H** and **ALR.L** as triggers
		d.SP1			Deviation Mode; triggers are deviations from **SP1**
		d.SP2			Deviation Mode; triggers are deviations from **SP2**
		CN.SP			Tracks the Ramp & Soak instantaneous setpoint
	ALR.H	____			Alarm high parameter for trigger calculations
	ALR.L	____			Alarm low parameter for trigger calculations
	A.CLR	REd			Red display when Alarm is active

Level 2	Level 3	Level 4	Level 5	Level 6	Notes
		AMbR			Amber display when Alarm is active
		GRN			Green display when Alarm is active
		dEFt			Color does not change for Alarm
	HI.HI	oFF			High High / Low Low Alarm Mode turned off
		oN	____		Offset value for active High High / Low Low Mode
	LtCH	No			Alarm does not latch
		yES			Alarm latches until cleared via front panel
		botH			Alarm latches, cleared via front panel or digital input
		RMt			Alarm latches until cleared via digital input
	CtCL	N.o.			Output activated with Alarm
		N.C.			Output deactivated with Alarm
	A.P.oN	yES			Alarm active at power on
		No			Alarm inactive at power on
	dE.oN	____			Delay turning off Alarm (sec), default = 1.0
	dE.oF	____			Delay turning off Alarm (sec), default = 0.0
ALM.2					Alarm 2
oUt1					**oUt1** is replaced by output type
	Note: This submenu is the same for all other outputs.				
	ModE	oFF			Output does nothing
		PId			PID Control Mode
			ACtN	RVRS	Reverse acting control (heating)
				dRCt	Direct acting control (cooling)
				RV.DR	Reverse/Direct acting control (heating/cooling)
		PId.2			PID 2 Control Mode
			ACtN	RVRS	Reverse acting control (heating)
				dRCt	Direct acting control (cooling)
				RV.DR	Reverse/Direct acting control (heating/cooling)
		oN.oF	ACtN	RVRS	Off when > SP1, on when < SP1
				dRCt	Off when < SP1, on when > SP1
			dEAd	____	Deadband value, default = 5
			S.PNt	SP1	Either Setpoint can be used of on/off, default is SP1
				SP2	Specifying SP2 allows two outputs to be set for heat/cool
		ALM.1			Output is an Alarm using ALM.1 configuration
		ALM.2			Output is an Alarm using ALM.2 configuration
		RtRN	Rd1	____	Process value for oUt1
			oUt1	____	Output value for Rd1
			Rd2	____	Process value for oUt2
			oUt2	____	Output value for Rd2

Level 2	Level 3	Level 4	Level 5	Level 6	Notes
		RE.oN			Activate during Ramp events
		SE.oN			Activate during Soak events
		SEN.E			Activate if any sensor error is detected
		OPL.E			Activate if any output is open loop
	CyCL	____			PWM pulse width in seconds
	RNGE	0-10			Analog Output Range: 0–10 Volts
		0-5			0–5 Volts
		0-20			0–20 mA
		4-20			4–20 mA
		0-24			0–24 mA
oUt2					**oUt2** is replaced by output type
oUt3					**oUt3** is replaced by output type (1/8 DIN can have up to 6)
PId	ACtN	RVRS			Increase to **SP1** (i.e., heating)
		dRCt			Decrease to **SP1** (i.e., cooling)
		RV.DR			Increase or Decrease to **SP1** (i.e., heating/cooling)
	A.to	____			Set timeout time for autotune
	tUNE	StRt			Initiates autotune after StRt confirmation
	GAIN	_P_	____		Manual Proportional Band setting
		_I_	____		Manual Integral Factor setting
		_d_	____		Manual Derivative Factor setting
	rCg	____			Relative Cool Gain (heating/cooling mode)
	oFst	____			Control Offset
	dEAd	____			Control Dead band/Overlap band (in process unit)
	%Lo	____			Low clamping limit for Pulse, Analog Outputs
	%HI	____			High clamping limit for Pulse, Analog Outputs
	AdPt	ENbL			Enable fuzzy logic adaptive tuning
		dSbL			Disable fuzzy logic adaptive tuning
PId.2	*Note:* This menu is the same for PID menu.				
RM.SP	oFF				Use **SP1**, not remote Setpoint
	oN	4–20			Remote analog Input sets **SP1**; range: 4–20 mA
			Note: This submenu is the same for all **RM.SP** ranges.		
			RS.Lo	____	Min Setpoint for scaled range
			IN.Lo	____	Input value for **RS.Lo**
			RS.HI	____	Max Setpoint for scaled range
			IN.HI	____	Input value for **RS.HI**
		0–24			0–24 mA
		0–10			0–10 V
		0–1			0–1 V

Level 2	Level 3	Level 4	Level 5	Level 6	Notes
M.RMP	R.CtL	No			Multi-Ramp/Soak Mode off
		yES			Multi-Ramp/Soak Mode on
		RMt			**M.RMP** on, start with digital input
	S.PRG	____			Select program (number for **M.RMP** program), options 1–99
	M.tRk	RAMP			Guaranteed Ramp: soak SP must be reached in ramp time
		SoAk			Guaranteed Soak: soak time always preserved
		CYCL			Guaranteed Cycle: ramp can extend but cycle time can't
			Note: tIM.F does not appear for 6 digit display that use a HH:MM:SS format		
	tIM.F	MM:SS			"Minutes : Seconds" default time format for R/S programs
		HH:MM			"Hours : Minutes" default time format for R/S programs
	E.ACt	StOP			Stop running at the end of the program
		HOLd			Continue to hold at the last soak setpoint at program end
		LINk	____		Start the specified ramp & soak program at program end
	N.SEG	____			1 to 8 Ramp/Soak segments (8 each, 16 total)
	S.SEG	____			Select segment number to edit, entry replaces # below
			MRt.#	____	Time for Ramp number, default = 10
			MRE.#	oFF	Ramp events on for this segment
				oN	Ramp events off for this segment
			MSP.#	____	Setpoint value for Soak number
			MSt.#	____	Time for Soak number, default = 10
			MSE.#	oFF	Soak events off for this segment
				oN	Soak events on for this segment

3. Operating Mode Menu (oPER)
   a. The following table maps the Operating Mode (oPER) navigation:

Level 2	Level 3	Level 4	Notes
RUN			Normal Run Mode, process value displayed, **SP1** in optional secondary display
SP1	____		Shortcut to change Setpoint 1, current Setpoint 1 value in main display
SP2	____		Shortcut to change Setpoint 2, current Setpoint 2 value in main display
MANL	M.CNt	____	Manual Mode, the RIGHT and LEFT buttons control output, displays **M###.#**
	M.INP	____	Manual Mode, the RIGHT and LEFT buttons simulate the input for testing
PAUS			Pause and hold at current process value, display flashes
StoP			Stop controlling, turn off outputs, process value rotating flash, Alarms remain
L.RSt			Clears any latched Alarms; Alarms menu also allows digital input reset
VALy			Displays the lowest input reading since the **VALy** was last cleared
PEAk			Displays the highest input reading since the **PEAk** was last cleared

Level 2	Level 3	Level 4	Notes
Stby			Standby Mode, outputs, and Alarm conditions disabled, displays Stby
tARE			TARE option - only available if enabled in INPt

Changing Temperature Units on the Omega Temperature Controller

1. Press the up button  until “oPER” appears on the screen.
2. Press the right arrow  until “1 NI t” appears on the screen. Press enter. 
3. Press the right arrow  until “RdG” appears on the screen. Press enter. 
4. “dEC.P” should be on screen. Press right arrow  to show “**°F °C**” on the screen. Press enter. 
5. Use arrows  to switch from °C to °F. Press enter. 
6. Press the up arrow  to go back to the “1 NI t” screen. Press the left arrow  to go back to “oPER”. Press enter to  see “RUN” and press enter again to  return to normal operating status.

Shut Down

- Switch System Power off.

Critical Spare Parts

(Contact Beahm Designs for current Price and delivery)

Part Number	Description
1153590-001	Heater (120V)
1157788-001	Heater (240V)
1143133-001	Thermocouple
1161899-001	Temperature Controller
1114668-005	Power Supply
1343250-001	MAC Valve

Warranty

Beahm Designs Inc. (BDI) products are backed by a 1 year warranty on parts and labor. Warranty is void for any Product returned if BDI determines that:

1. The asserted defect is not present,
2. The asserted defect is attributable to misuse, improper installation, alteration (including removing or obliterating labels and opening or removing external covers (unless authorized to do so by Beahm Designs), accident or mishandling while in the possession of someone other than Beahm Designs, Inc.
3. The Product was not sold to you as new.

Return Material Authorization (RMA)

No Product may be returned directly BDI without first contacting BDI for a Return Material Authorization ("RMA") number. If it is determined that the Product may be defective, you will be given an RMA number and instructions for Product return. End Users are required to include a copy of the RMA receipt inside the return box to receive replacement product under warranty. An unauthorized return, i.e., one for which an RMA number has not been issued, will be returned to you at your expense. To request an RMA, please call 928-556-3109 or email info@machinesolutions.com

For additional information on Beahm Designs, Balloon Bonder, please visit http://machinesolutions.com/our-products/