



## MACO® BREEZE Parison Control



*Product Information*



# MACO<sup>®</sup> BREEZE Parison Control

## Overview

- *All-in-one packaging*
- *Simple installation with prewired cables*
- *Factory configured based on time or position*
- *Up to 2 separate heads*
- *Precise 100 point parison and open loop velocity pushout control*
- *Separate weight and die gap settings*
- *Large graphical electroluminescent display*
- *Built in SPC, X-bar, R and histogram charts*
- *Four security levels*
- *Diverging or converging heads*
- *RS-232 printer port*
- *24 built-in pushbuttons*
- *Ability to store parison setups to internal memory or external cartridges*

## Overview

The Breeze parison-only controller is specifically designed for simple installation and ease of use. It can be retrofitted on a wide variety of blow molding machines to provide consistent wall thickness of blow-molded products for improved quality, less material consumption and reduced scrap. It can also be specified on new OEM blow molding machinery.

The Breeze is factory configured for most blow molding applications. Specify the machine type and the Breeze will be factory programmed and wired for that machine. Preconfigured applications are:

Continuous Extrusion, 1 Head

Continuous Extrusion, 2 Heads

Position Based 1 Accumulator, 1 Head Proportional or Solenoid Valve Pushout

Position Based 1 Accumulator, 2 Heads Proportional or Solenoid Valve Pushout

The all-in-one package comes standard with pre-wired cables that connect to the back of the unit. After connecting the cables, the installer follows the labels diagram shipped with the Breeze to connect wires to the proper points on the machine. Once the unit is installed, simply calibrate the head/accumulator and enter the desired parison profile.

The 100 point parison profile is displayed graphically on a large Electroluminescent (EL) display. This enables the user to quickly modify the profile and compare it to the actual process value. The entered profiles can then be stored either internally or on removable INSTA-SET™ memory cartridges.

The standard Statistical Process Control (SPC) feature provides the user with valuable process data to predict problems before they occur and to document part quality. SPC data and graphs can be printed through the RS-232 printer port.

The Breeze uses the same cards as Barber-Colman's MACO<sup>®</sup> 6000 total machine controller. This allows users to stock fewer spare parts. It also provides users with highly precise parison control. The Breeze updates parison tooling position every 0.1 milliseconds to minimize material usage and improve part quality.

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## Configurations

Based on the model number ordered, the Breeze is shipped with either a time based or position based configuration. Both the program downloaded into the Breeze and the internal/external wiring are different between configurations. All configurations share the same internal cards and system screens.

## Main Menu

The power up security code allows the Breeze to be operated with only 4 screens. The main menu screen allows the user to choose one of four security levels. Setup personnel can be given security codes that allow complete access to setup information as well as to the normal operating screens. Operators can be given security codes that provide access only to the operating screens.

The user can move through the screens either by pressing the path keys on the bottom of each screen or by pressing the left most path key to return to the main menu and then selecting the desired screen from the main menu.

Only screens that are at or below the entered security code will be accessible. The screens are grouped according to the level of access:

Level 1	Normal Operation without SPC access	User
Level 2	Normal Operation with SPC access	User
Level 3	Field Configuration and Tuning	Setup personnel
Level 4	Factory Configuration	Factory personnel

## Recipe Storage

Recipe storage can reduce startup time and allow easy job transfer between different machines. All entered setpoints can be saved to either internal memory or to memory cartridges. Approximately 15 different recipes can be saved internally or to a single memory cartridge.

## Parison Profile

The parison profile screen is used to enter and view the parison and pushout profile. The entire profile can be viewed on this screen. The user can enter any number of master setpoints (two or more), and select any one of five modes of interpolation (flat, linear, and three types of parabolic) to automatically interpolate the remainder of the 100 profile points.

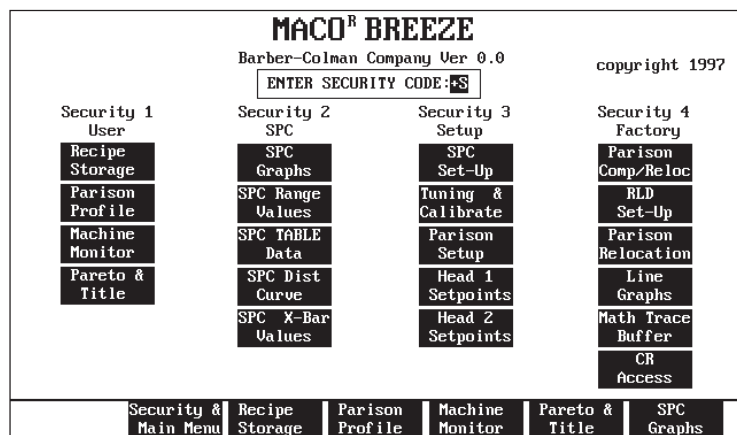


Figure 1. Security & Main Menu

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Separate profiles can be entered for Head 1 and 2. Both the parison and pushout process value can viewed on the parison profile screen. Just enter the process value to be displayed and either the parison target and process setpoints or the pushout target and process setpoints can be displayed.

An orientation mark can be placed on a part with the parison "lock" point feature. Specify any of the 100 parison points as a "lock" point and interpolation will not interpolate the point. The time based profile screen is identical to the position based screen except that several of the diegap setpoints have been removed.

## Machine Monitor

The machine monitor screen provides an overview of the entire process. Graphical sprites move with either one or two heads and a bargraph moves with the pushout motion. Both cycle time and total number of cycles are tracked. A timer for Pushout and Fill are used to abort auto cycle if cushion or shotsize are not reached before the timer expires. The time based machine monitor screen functions identically to the position based screen except that the setpoints and timers have been changed to reflect time based operation.

## Pareto and Title

Eight pushbuttons (operator station keys 17-24) have been allocated to pareto analysis. Each key can be assigned problem codes (bad part, grinder jammed, conveyer stopped, etc.). Every time the assigned problem occurs the corresponding key can be pressed. At the end of the day or shift the pareto screen can be viewed to determine the frequency of the problems.

## Statistical Process Control (SPC)

SPC provides for the simultaneous calculation of different process parameters. X-bar, R and histogram charts can be displayed for each of the values. Calculated X-bar, R, Cr, and CpK values are also available.

The last 100 calculated values for each of the parameters remain in memory and are available for the operator to view and print on demand or automatically after 100 points have been collected. SPC alarms based on industry accepted standards are available to make machine decisions based on part quality.

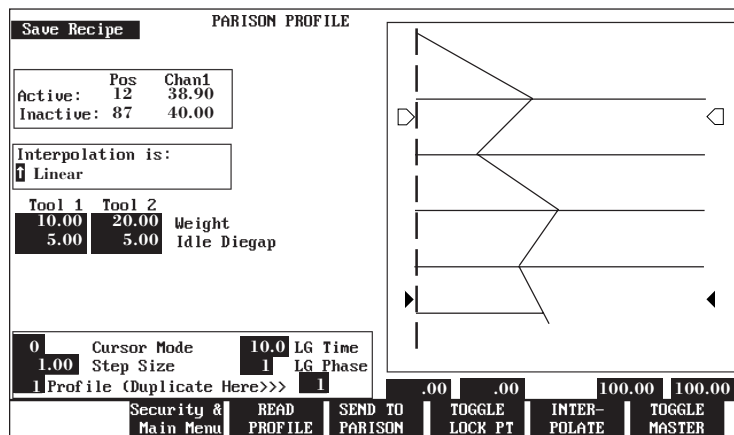


Figure 2. Parison Profile Screen (Time Based)

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Position based configurations allow SPC on:

1. Deviation between setpoint and process value for Head 1 tool movement
2. Deviation between setpoint and process value for Head 2 tool movement
3. Pushout Time
4. Overall Cycle Time

Time based configurations allow SPC on:

1. Sync Time
2. Deviation between setpoint and process value for Head 1 tool movement
3. Deviation between setpoint and process value for Head2 tool movement

## Display

The Breeze features a 9.0" diagonal Electroluminescent (EL) display. The EL display provides crisp, well defined text and graphics for "easy on the eyes" readability using amber against a soft, dark background.

## RS-232 Port

The RS-232 port is used for printing SPC charts and downloading modified configurations.

## Startup Requirements

Time and position based inputs:

Source power required

110 Vac, 0.5KVA

24 Vdc for Breeze 24 Vdc outputs - 150 mAdc minimum

Head LVDT positioning sensor with +/-12 Vdc

Each discrete input requires a DC voltage (On = 10 Vdc, Off = 5Vdc)

Time and position based outputs:

Each digital output requires a solid state relay to convert low current (20mA)

24 Vdc outputs to a high current 120 Vac or 24 Vdc output

Exitation provided for the head LVDT and pushout linear positioning sensors

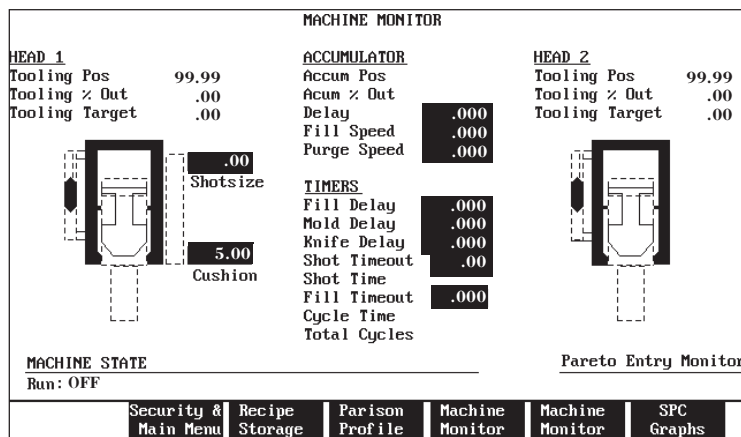


Figure 3. Machine Monitor (Position Based)

## Position based inputs and outputs:

Pushout sensor with +/-10 Vdc, 500 - 2000 Ohms

### Discrete input/output assignments:

Digital i/o cable, DC In 1	rising edge to begin pushout
Digital i/o cable, DC In 2	high indicates pump/motor on
Digital i/o cable, DC In 3	high indicates gates closed
Digital i/o cable, DC In 4	not used
Digital i/o cable, DC Out 1	high during fill, solenoid recovery valve
Digital i/o cable, DC Out 2	high during pushout, solenoid pushout valve
Digital i/o cable, DC Out 3	rising edge to trigger close mold
Digital i/o cable, DC Out 4	rising edge to trigger knife

### Analog input/output assignments:

Cable #1, Ana In 1	head #1 position sensor input
Cable #1, Ana In 2	head #2 position sensor input
Cable #2, Ana In 3	accumulator position sensor input
Cable #2, Ana In 4	not used
Cable #1, Ana Out 1	head #1 valve drive signal
Cable #1, Ana Out 2	head #2 valve drive signal
Cable #2, Ana Out 3	pushout signal (for proportional output)
Cable #2, Ana Out 4	not used

### Machine function key assignments:

Machine function key 1	run
Machine function key 3	clear pareto
Machine function key 6	alternate idle diegap
Machine function key 7	fill
Machine function key 8	purge
Machine function keys 17-24	problem logging 1-8

## Time based inputs and outputs:

### Discrete input/output assignments:

Digital i/o cable, DC In 1	rising edge to run profile (sync pulse)
Digital i/o cable, DC In 2	high indicates pump/motor on
Digital i/o cable, DC In 3	low indicates side 1 selected high indicates side 2 selected
Digital i/o cable, DC In 4	high to enable mold and knife timed outputs
Digital i/o cable, DC Out 1	rising edge to trigger close mold 1
Digital i/o cable, DC Out 2	rising edge to trigger knife 1
Digital i/o cable, DC Out 3	rising edge to trigger close mold 2
Digital i/o cable, DC Out 4	rising edge to trigger knife 2

### Analog input/output assignments:

Cable #1, Ana In 1	head #1 position sensor input
Cable #1, Ana In 2	head #2 position sensor input
Cable #2, Ana In 3	not used
Cable #2, Ana In 4	not used
Cable #1, Ana Out 1	head #1 valve drive signal
Cable #1, Ana Out 2	head #2 valve drive signal
Cable #2, Ana Out 3	not used
Cable #2, Ana Out 4	not used

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Machine function key assignments:

Machine function key 1	run
Machine function key 3	clear pareto
Machine function keys 17-24	problem logging 1-8

## Non-Factory Configurations

Non-factory configurations can be supported by either a rack based MACO 6000 system or by modifying the Breeze user screen set with the Barber-Colman OptiGrafix Screen Editor. (Breeze Screens are available at no charge on the Barber-Colman BBS.) Consult the Control System Price Guide to quote factory modification of standard configurations.

## Technical Support

Barber-Colman Company offers application engineering services and technical training classes to assist with system upgrades, enhancements, logic programming, machine start-up and troubleshooting, and performance tuning. Barber-Colman delivers these services using qualified professionals employed by Barber-Colman Company, our Systems Integrator partners, or Authorized Representatives.

Contact your Barber-Colman Representative for additional information regarding services available from Barber-Colman Company.

## Control Specifications

### General

<i>Voltage</i>	90 to 135Vac
<i>Power</i>	<=100VA@120
<i>Control Transformer</i>	0.5KVA
<i>Operating Temperature</i>	0 to 50 °C (32 to 122 °F)
<i>Storage Temperature</i>	-40 to 75 °C (-40 to 158 °F)
<i>Humidity</i>	0 to 95% rh, non-condensing at 40 °C (104 °F)

### Parison

<i>Segments per profile</i>	100
<i>Head loops</i>	1 or 2 closed loops (proportional, integral)
<i>Master profile points</i>	choice of two or more
<i>Interpolation</i>	one of five
<i>Profile Display</i>	actual versus target
<i>Weight</i>	separate setting per profile
<i>Die Gap</i>	separate setting per profile
<i>Loop Closure</i>	0.1 millisecond
<i>Parison Analog Inputs</i>	four +/-12 Vdc
<i>Input Impedance</i>	500-2000 Ohms
<i>Maximum Input</i>	+/-15Vdc
<i>Isolation</i>	each I/O pair isolated from other pairs
<i>Resolution</i>	14 bits (1.8mV/3.7uA)
<i>Parison Analog Outputs</i>	four +/-10 Vdc
<i>Current</i>	4.5mA maximum into 2.2K $\Omega$ load
<i>Isolation</i>	each I/O pair isolated from other pairs
<i>Resolution</i>	14 bits
<i>Excitation for Pushout LP</i>	+10 Vdc @ 20 mA
<i>Pushout Segments per profile</i>	100
<i>Pushout Loop</i>	Open Loop

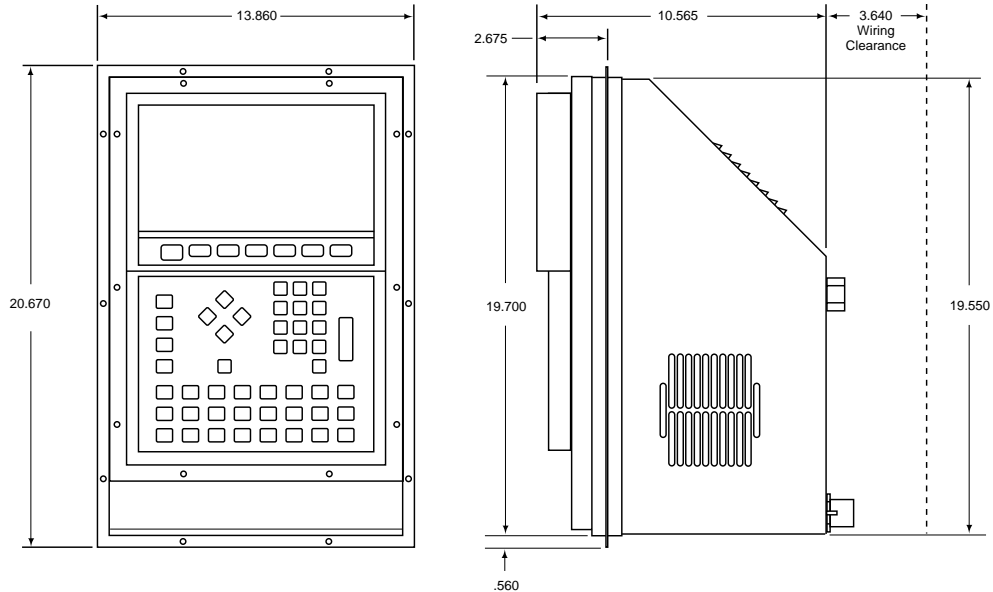
*Timers*

Eight	0 to 6553.5 seconds
Four	0 to 30.000 seconds, 0.002 repeatability
<i>Real Time Clock</i>	Seconds, minutes, hours, day, month, year
<i>Discrete Inputs</i>	Four, -0.6 to 40 Vdc
<i>On voltage</i>	$\geq 10$ Vdc
<i>Off voltage</i>	$\leq 5$ Vdc
<i>Current</i>	Less than 10 mA at 24 Vdc
<i>Isolation</i>	Logic I/O isolated as a group
<i>Discrete Outputs</i>	Four 24 Vdc maximum switched
<i>Current</i>	20 mA maximum switched
<i>Isolation</i>	Logic I/O isolated as a group
<i>Communication Port</i>	One, RS-232
<i>Servo Amplifier</i>	
<i>Outputs</i>	Four, 150 mA maximum per channel (total servo amplifier power supply load, including excitation, must not exceed 500 mAdc)

*Inputs*

<i>LVDT Excitation</i>	Four, +/-10 Vdc
<i>Operator Station</i>	12 Vdc @ 100 mA maximum
	9.0" Diagonal Electroluminescent Display
	INSTA-SET Recipe Storage
	24 Machine Function Keys

**Physical Specifications**



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