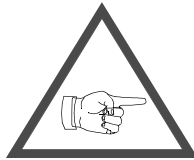


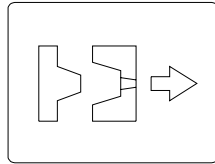
2.4 AUTO PROTECT



NOTE!

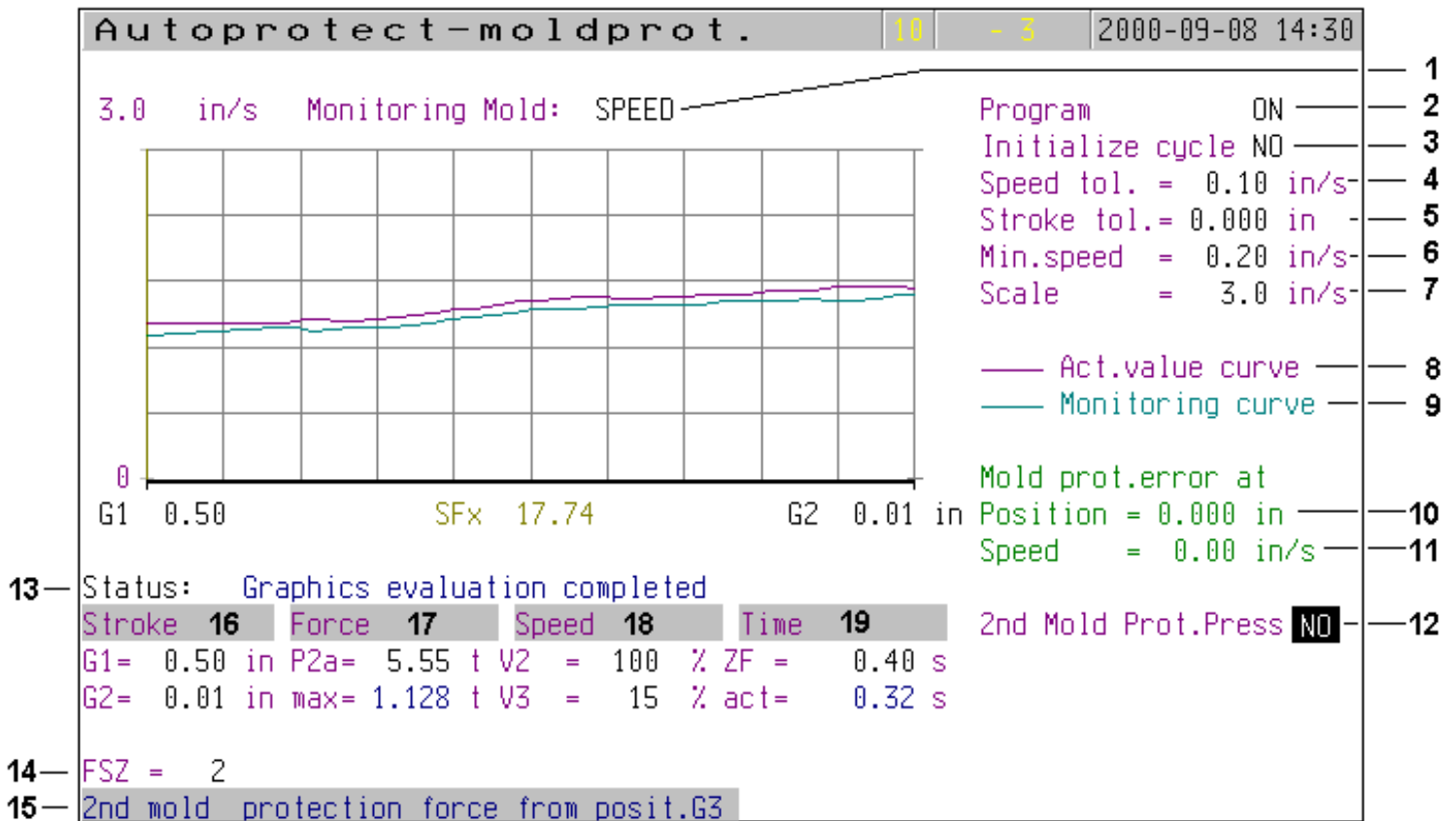
Autoprotect is only available from System Version SV2.00 or greater

PRESS



+ F3

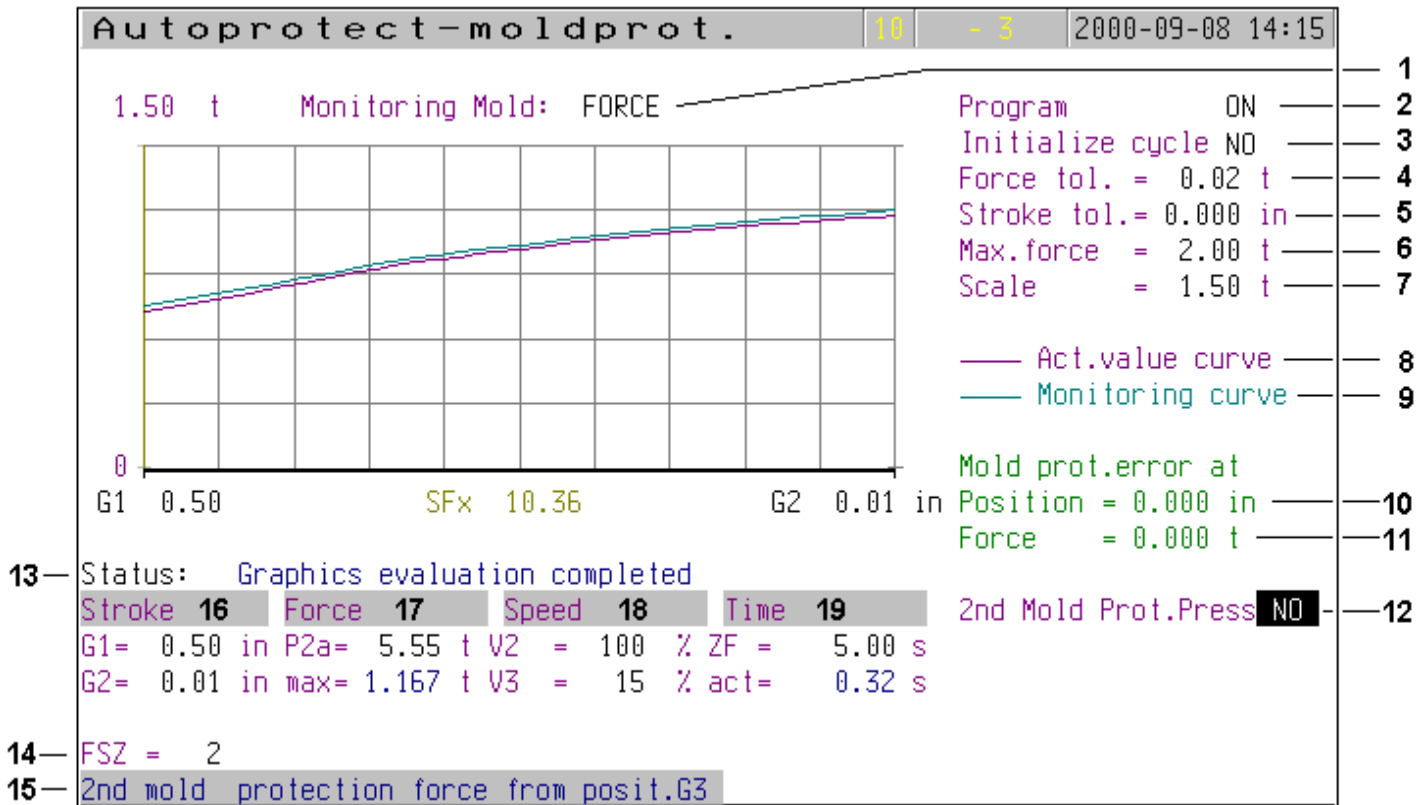
SPEED MONITORING



Refer to the line numbers on the following pages for the description of each variable.

- F1** MOLD CLOSING
- F2** SET VALUE GRAPHICS
- F3** AUTO PROTECT
- F4** CLAMPFORCE
- F5** MOLD HEIGHT
- F6** INJECTION COMPRESION/COINING

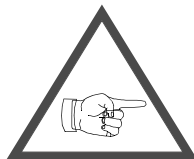
FORCE OR HYDRAULIC PRESSURE MONITORING



Autoprotect - precision mold protection - is achieved either by force (pressure) or speed monitoring. Any variation in the current speed or pressure outside a set tolerance compared to a predetermined monitoring curve, activates the mold protection.

The monitoring curve is recorded during the first cycle and all other curves are compared with the monitoring curve. Alternatively the monitoring curve can be re-initialized after each successful mold closing sequence.

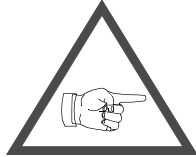
If the control voltage is switched off or any of the mold closing parameters are changed, the monitoring curve is automatically erased and initialized on the next successful mold closing sequence.



NOTE!

The first closing function or first closing after a parameter change will not be monitored by Autoprotect curve. During these times mold protection will only rely on the setting in “max force / min speed” and the time set in ZF

Autoprotect requires one successful closing function to generate a monitoring curve. The initial closing function relies on the protection afforded by the mold closing screen page. It is recommended to set the last closing speed to a low value (i.e. 10 -15%)



NOTE!

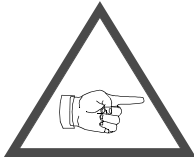
When changing the following parameters the mold protection monitoring is re-initialized during the next cycle and the Autoprotect monitoring curve is not active during this cycle.

Mold protection monitoring relies on the setting in “Max force / Min speed” and the time set in ZF during this time.

Closing strokes:	A,W3,W1,G1,G3,G2	
Closing speeds:	V1,V2,V3	
	35043	Speed on G2
	35068	Speed on position mold closed
Mold protection pressures:	P2,P2e	
Ramps:	35131	Speed braking after W3
	35139	Speed braking to W1
	35132	Speed braking before or after G2
	35155	Speed braking on position mold closed
	35171	Speed start acceleration mold closing
	35147	Pressure braking on position G3
	35148	Pressure braking on position G1
Minimum speed	24353	Minimum speed at speed measurement
Maximum force	24208	Maximum force at force measurement
Stroke tolerance	28174	Stroke tolerance for strongly dynamic curves

Switch on of the mold protection monitoring.

Switchover from pressure to speed monitoring and vice versa.



NOTE!

The maximum time for recording a monitoring curve is 8 seconds, mold protection must not exceed this time.

1... **Monitoring** **SPEED / FORCE**

The type of monitoring required is selected here by entering a 0 for SPEED monitoring or a 1 for FORCE monitoring. Toggle machines can only use speed monitoring.

Speed monitoring:

The speed of the mold closing is monitored during the mold protection phase between G1 and G2. The actual speed curve is displayed and compared with a monitoring curve recorded earlier. When the mold closing function encounters an obstacle, preventing mold closing, the speed profile will change. If the speed changes are outside the curve tolerances, mold protection is activated.

The mold protection monitoring time is also active in parallel with the speed monitoring.

Force monitoring

Force monitored mold protection requires an additional pressure transducer on the high speed closing cylinder for Tiebarless machines. The additional pressure transducer must be enabled on the machine set up page of the service menu.

The pressure in the "high speed" cylinder is monitored during the mold protection phase between G1 and G2. The pressure values are displayed as a curve on the screen page and compared with a curve recorded earlier. If the actual pressure values exceed the monitoring curve tolerance, mold protection is activated.

The mold protection monitoring time is also active in parallel with the force monitoring.

2... **Program** **ON / OFF**

Enter 1 on this line to turn the program on, or 0 to turn the program off. If the program is turned off the normal mold protection set up on the "Mold Closing" page is still effect.

3... **Initialize cycle** **NO / YES**

When the "Initialize cycle" is set to NO, the monitoring curve is recorded during the first successful mold closing sequence and the current actual curve is compared to that initial monitoring curve.

When the "initialization cycle" is switched to YES the monitoring curve is freshly recorded from each successful closing sequence and the current actual curve is effectively compared with the last successful curve. A new monitoring curve is drawn on the previous actual curve.

This setting effectively compensates for variations in the machine or mold, until optimum operating temperature has been reached. Engel recommends that during the start up of a process that the line "Initialize cycle" be set to YES until a stable process has been established. Once the process is stable and the machine is producing the parts required, switch "Initialize cycle" to NO.

4... Speed / Force tol. = 1.00 in/s

If SPEED is selected as the monitoring choice, the speed tolerance setting is displayed. Conversely if the FORCE is selected the force tolerance setting is displayed.

The tolerance is the amount that the monitoring curve is vertically displaced from the actual curve. The displaced monitoring curve is above the actual curve when force is used and below the actual curve when speed is used.

5... Stroke tol. = 0.000 in

This is a tolerance set on the horizontal plane of the monitoring curve. The tolerance can allow for horizontal variation of the actual curve during the mold protection phase, between G1 and G2, without going into mold protection alarm.

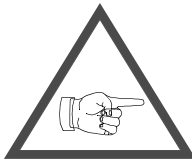
In most situations, this tolerance can be set to zero. A stroke tolerance may be required when a process demands a high speed to G1 and a fast braking ramp to G2. This situation would result in a curve with a steep gradient to G2.

Due to the way the controller samples the values of the "actual curve", sampling of the start position of the curve may begin a little earlier or later than the "monitoring curve". This situation could result in the two curves being slightly displaced in the horizontal direction. This only becomes a problem when part of the curves have a steep gradient.

Stroke tolerance allows for horizontal variations in curve position, by the amount entered on the "Stroke Tolerance" line. The curve may be out of tolerance as far as force or speed is concerned but as long as it is only out of tolerance for the distance set in the stroke tolerance, there will be no mold protection alarm. When the curve is out of tolerance for more than the distance set stroke tolerance the machine goes into a mold protection alarm.

A good starting point for stroke tolerance would be approximately 0.008 of a inch (0.2 mm). Mold protection will become less sensitive if too large a tolerance is set.

6... Min Speed/Max Force = 0.002 in/s



NOTE!

A value must be entered into the minimum speed or maximum force to ensure that basic mold protection is available during any initialization phase.

This line is set depending upon the type of mold protection chosen. The maximum force or minimum speed is a safety limit that is only in operation during initialization of the curve. A mold protection alarm will result, if this set variable is exceeded during initialization.

A typical value for minimum speed is 0.004 in/s (0.1 mm/s)

A typical value for maximum force is 80% of the mold protection pressure set in P2a.

7... Scale = 15.0 in/s

This line sets the scale of the Y axis of the monitoring curve. This should be set greater than the expected maximum to ensure that the monitoring and actual curves are displayed to their best resolution.

If no value is set here, the scale is automatically set so that the maximum values for the curve lie in the upper portion of the graph.

8.... ___ Act. value curve

This line represents the actual speed or force of the mold protection function in real time. This curve is redrawn during each cycle.

9... -----Monitoring curve

This line represents the monitoring curve. This curve is used as an ideal to compare the actual curve to during mold protection.

10.. Mold prot.error at Position = 0.000 in

This is the actual position at which the mold protection was activated. The value is not erased during multiple closing attempts so that the error can be more easily identified.

11.. Mold prot.error at Speed = 0.000 in/s

This is the actual speed at which the mold protection was activated. The value is not erased during multiple closing attempts so that the error can be more easily identified.

12.. 2nd Mold Prot.Press NO / YES

Enter 1 on this line to activate the second mold protection pressure.

G3 the start of the second mold protection pressure will be displayed on the graph and under the "Stroke" column.

This feature is used where a higher pressure is required for the last part of mold closing. For example; with a mold that has a spring loaded section that would require extra force to close the mold against the spring pressure.

13.. Status

This line displays the current status of the mold protection monitoring. The following messages are displayed:

- Monitoring switched off.
- Initialization active.
- Monitoring active.
- Monitoring and Initialization active.
- Initialization finished.
- Monitoring complete.
- Measuring time error.
- Mold protection error.
- Graphic evaluation completed.
- Mold protection evaluated.
- No graphic data existing.

14.. FSZ = 2

If the mold protection alarm is activated, and this counter is set higher than zero, the control will open the mold, eject, and try to close again for the number of times set for this counter. In effect the machine will try to clear itself of the obstruction, up to a maximum of 9 times, before actually stopping due to a mold protection alarm.

15.. Brief description of screen page lines

Where ever the cursor is placed, a brief description of that line is given.

16.. Stroke

G1, G2 and G3 are set to suit the mold and process. Larger parts will require a larger value for G1. Special molds may require a second, higher pressure (P2e) at position G3 to reach G2 in a reasonable time. When screen line 12 is set to YES, G3 will appear on the Mold closing screen page and here on line 16 on the Autoprotect screen page.

G1 = Start of mold protection

G3 = Start of second mold protection pressure P2e (G3 is displayed when the “second mold protection pressure” is enabled on line 12).

G2 = End of mold protection

FSZ = The number of mold closing attempts when mold protection occurs.

17.. Force

Mold protection pressure should be set at least high enough so that the mold goes through mold protection successfully. Ideally the mold protection pressure should be set so the mold protection phase is completed as consistently and quickly as possible. The mold protection curve should be nearly identical to the monitoring curve.

P2a = Mold protection pressure from position G1.

P2e = Mold protection pressure from position G3 (P2e is displayed when the second mold protection pressure is enabled on line 12).

max = This is the actual maximum force required to successfully move through mold protection.

18.. Speed

The speeds through mold protection should be set to suit the type of mold and to achieve a reasonable cycle time. For example, a heavy mold with a short mold protection stroke would require a slower speed to prevent the inertia of the moving components from carrying the mold through mold protection stroke without any protection.

V2 = Second closing speed from position W3 to position W1.

V3 = Third closing speed from position W1 to position G2

19.. Time

Initially set ZF to a large value until the process is stable and running good parts, then set the time down to a value close to, but slightly greater than, the actual time.

ZF = Maximum mold protection monitoring time.

act = Actual mold protection time.