IPC

CONTROL GAGING INCORPORATED

Intelligent Process Control

Statistics-driven software dynamically adapts itself to the process and optimizes Cpk

The IPC software option available in the D500 gage controller provides a sophisticated, self-improving method for reducing the variation of size output until it achieves the best capability of the machine tool.

When used with an automatic gaging system of the type provided by Control Gaging, the D500 with IPC implements a closed-loop system that reduces scrap, lowers direct labor costs, improves productivity, and improves part conformance to specifications.

In a typical installation the parts are transported into and through a fixture, where an electronic gage sends the D500 a precise measurement for each part. The D500 assembles the data into subgroups and generates a unique run-time display called the Trend Page.

The Trend Page is the heart of the IPC. It shows a real-time X-bar and R chart with additional features that make the size trend, the actions of the gage system, and the response of the machine all "visible" to the user at a single glance.

D500 Gage Controller with IPC Trend Page displayed

Principles of IPC Operation

The IPC uses four specialized techniques in combination to control and refine the machine's output:

Proportional compensation	The gage controller, not the machine, defines the amount of compensation in order to drive size directly to nominal.
Scaled response	The farther the sigma deviation of the current readings from size, the smaller the number of subgroup averages needed to initiate a compensation.
Intelligent control limits	As proportional compensation and scaled response bring size closer to nominal, the control limits are recalculated and become narrower. The system will continuously refine the frequency and distance of compensations until they are as small and as frequent as the process and the machine will allow
Anomalous readings discarded	The IPC monitors sequential size readings and can be programmed to ignore the kinds of fliers or false readings that occur in a specific process, preventing false responses.

TAKE CONTROL & SAVE MONEY

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CGI CONTROL GAGING INCORPORATED

As the process improves, the sigma limits tighten.

Our IPC software employs a statistical process control technique which includes progressive adjusting of the Upper and Lower Control Limits. Progressive adjusting of the control limits is accomplished by interpreting the ranges within part sub groups to determine the current stability and capability of the machine. By progressively adjusting the control limits, the best response without over-compensating is insured.

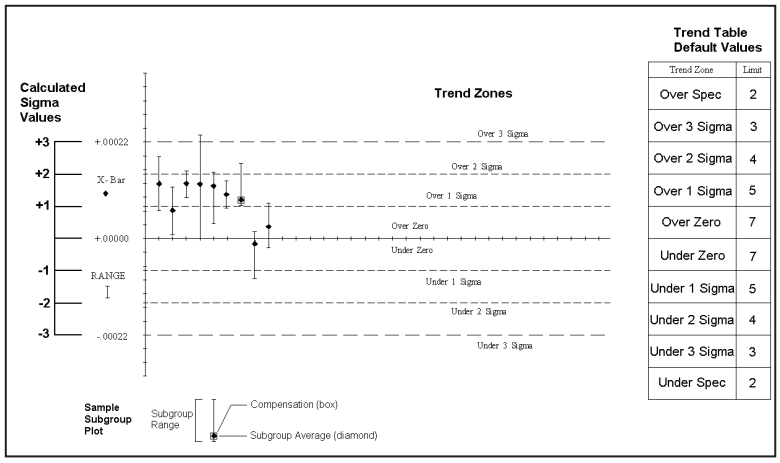
To provide quick response when your part size starts to trend away from nominal, IPC employs a scaled response time combined with proportional compensation. As the average part size differs from the nominal size, compensation is initiated and sent to the machine to get your parts back to nominal size.

As a safe guard against erroneous compensations within production runs, the IPC software keeps track of the sequential part sizes and can be programmed to exclude anomalous part size readings from the compensation algorithms.

By progressively adjusting the control limits, scaling response time, sending a proportional compensation and using only good data points, the system creates a very narrow part size band, as tight as the machine's mechanical capability can produce.

The Trend Page displays the process.

The Trend Page (right) shows the size trend chart, compensations as they occur (11), last part size (7), and allows minor size adjustments (8) without going to another page. It also indicates when an "anomalous" reading has been limited by our "Analogic" feature. Although the anomalous reading has been adjusted for the purpose of compensation, it can still be classified as a bad part and diverted by the Control Gaging parts diverter (if equipped).

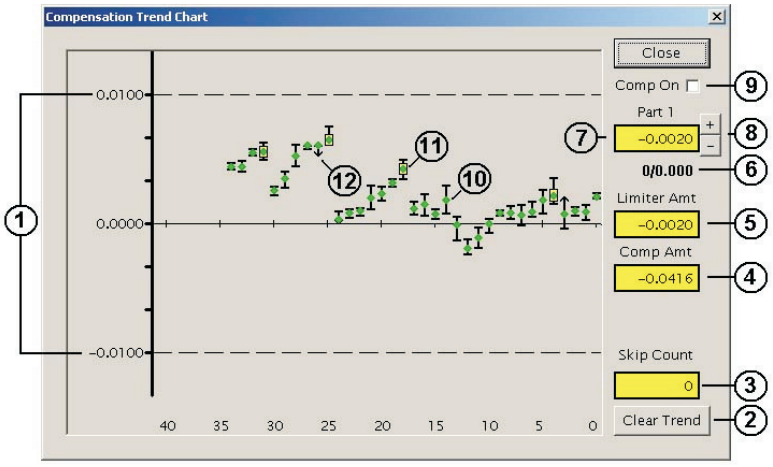


Trend chart showing sigma values, zones, and trend table

The Trend Chart controls the process.

The software maintains and updates a specialized control chart as shown in the figure above and the sample Trend Page below. The chart is divided into zones: eight are based on the sigma value calculated on the last lot, and two (not shown) are defined by the part specification. A compensation occurs if a certain number (defined by a user-configurable Trend Table) of subgroup averages fall within or beyond a zone.

Each subgroup of readings is represented by a vertical line on the chart. The length of the line represents the range of the subgroup, and the "diamond" on the line shows the average. A square box indicates that a compensation signal has been given at that subgroup.



Trend Page example from User's Manual

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