Since the possible amplification K_v depends on the dynamic characteristics of the entire drive, and therefore cannot be selected at random, the omission of lag errors particularly affects drives with low oscillation frequencies.

Example:

f_{oA} = 10 Hz
v = 0.5 m/sec

$w_{oA} = 2\pi f_{oA} = 62.8\ s^{-1}$

$k_v = 0.3\ w_{oA} = 18.8\ s^{-1}$

f_{oA} ... Oscillation frequency
v ... Velocity
Δx ... Lag distance

$$\Delta x = \frac{v}{k_v} = 26.5 \text{ mm (lag distance without feed-forward)}$$

The loop controller has P or PI characteristics depending on the defined parameters.

Scan Time

Digital controllers with constant scan times do not continuously compare the actual and set positions but use time periods (scan time). This is not relevant as long as the scan time is short in comparison with the delays of the drive. Basic Formula:

$$T_A \leq \frac{1}{f_{oA}}$$

T_A ... Scan time
f_{oA} ... Oscillating frequency of the drive

If the drive is faster, the speed amplification k_v can be increased but not higher than would be done for a continuous controller. The potential accuracy of the drive cannot be fully utilized.

Example:

T_A = 2 msec

$$f_{oA} < \frac{1}{10\ T_A} = 50 \text{ Hz}$$

$w_{oA} = 2\pi f_{oA} = 314\ s^{-1}$

$k_v = 0.3\ w_{oA} = 94\ s^{-1}$

Set Value Resolution

The more distinct the steps of the analog output are, the less often the position controller has to switch between the digital/analog converter steps. The speed profile is steadier and the performance in holding control is much better.

Example:

16 Bit for ±10 V
v_{max} = 0.5 m/sec

$$\Delta U = \frac{20 \text{ V}}{65536} = 0.3 \text{ mV}$$

$$\Delta v = \frac{2\ v_{max}}{65536} = 15\ \mu\text{m/sec}$$

Interference Compensation

In order to transmit the high resolved setpoint values under industrial conditions (adjoining interference sources) to the servo amplifier without errors, MAC1 provides a system, developed by B&R, for disturbance pulse compensation.

Counter Frequency

The simultaneous requirements for high encoder resolution and high speed lead to higher counting frequencies with incremental encoders.

Example:

v_{max} = 0.5 m/sec
Δs = 0.2 µm

f_{max} = 2.5 Mio Inc/sec

Incremental Encoder Filter

The higher the maximum counting frequency is, the smaller the input filters of conventional counter modules must be. This also means that the susceptibility to disturbance is greater. B&R has put a damper on the problem for the MAC1 with which interference has one hundred percent less chance of causing problems in comparison with conventional circuitry.

Signal Monitoring

If encoder signal deviations are so strong that errors might be expected in spite of the filter, the MAC1 sends an error message that can be recognized through the application program.

ORDER DATA

MAC1 Axis Controller, highly dynamic positioning module, incremental encoder connection up to 700 kHz input frequency, integrated digital filter for incremental encoder input, maximum counter frequency 2.8 MHz at quadruple evaluation, connection of serial absolute encoders, encoder supply 5.24 VDC adjustable, analog output to the motor controller (±10 V, 16 Bit) with interference compensation, 6 digital inputs, one of which is a quick trigger input, three digital outputs, all inputs and outputs electrically isolated	**HCMAC1-0**