# Experimental filter setting for bearing controller with cascade speed controller

The following description is for the products MCU-3000 / MCU-6000, MCU-3T, MCU-6, PA 8000, PS 840, APCI-8001 and APCI-8401.
**This instruction is only valid for drive systems with servo speed controllers. For other drive systems, like current regulated systems or stepper motor systems, this procedure cannot be used.**

# Standard controllers

When using a speed controller, the filter parameters listed below must be set:
kp, ki, kfcv

All other parameters stay on 0. The setting can be improved with kd only in insufficiently damped systems. This instruction requires that the user knows the menus and terminology of the program mcfg under Win 32. The procedure for taking over the modified filter parameters (Update Filter) and for starting and backing up of the trapezoid profiles as well as the display of the traverse movement in a graphical interface must be known.

**Furthermore, it is required that the user is aware that the axes are sometimes traversed uncontrolled and that this is possible at any time and that, for example because of a wrong entry, unexpected traverse movements occur. Therefore it must be guaranteed that the respecting motor can turn freely and that a Stop by the emergency shutdown is guaranteed at any time.**

## *Presettings*

Firstly, the traverse movement is recorded in the open loop. Here, it must be checked if the turn direction is correct (positive output values must cause positive count direction) and if the transient response of the speed control corresponds with system in accordance with the rules (comparable with the e-function of the transient response of the true speed).

## *Setting of kp*

The axis is traversed with a trapezoid speed profile with adequate acceleration ramps and adequate maximum speed. The traverse distance should be so long that for the acceleration range, the linear traverse range and the braking range always 1/3 of the traversing time is required. Now the proportional factor kp is calculated experimentally of small values (approx. 0.1), beginning until the true value follows the set value the best way but without that the stability is worsened obviously. Realisitc values range between 0.1 and 10. The found value for kp will be written down.

## Optional D-part

If the transient response cannot be set without an overswinger, it can be eliminated by adding a D-part. If this value is found, kp usually can be increased.
**Caution:** By using a D-part, the bearing control loop can become instable only by a slight increase.

## *Setting of kfcv*

Afterwards kp (and if necessary also kd) is set again on 0 and the speed pre-regulation coefficient kfcv will be calculated in a similar way like kp. However, in this case the value begins with 1. Realistic values range here between approx. 10 and 200. This parameter is compared in the way, that the max. speed is on the same level at the true value and set value. The found value will be written down.

**Caution:** When this setting is used, the system will be operated only controlled, this means that a speed set value is put out and the set speed course is proportional (trapezoid course). In some cases

an overswing can be noted, especially after the end of the acceleration and braking phase can be noted. Furthermore, because of inadequately selected factors unexpected big or fast traverse movements are possible. In addition, the system may not stay unattended, as otherwise the axes would drift away and cause damage. After the calculation of kfcv, the control loop should be opened in order to prevent traverse movements in jumps by the reactivation of the proportional controller.

## *Common setting of kp and kfcv*

At kp and kfcv the values that were written down will be entered. When traversing, the axis should be stable. The true velocity course should follow the set velocity course without any significant deviation. Only at the end of acceleration and braking ramp, overswingers or transient processes may be noted. In general the value of kp must be modified here slightly downwards in order to improve the controlling behaviour or to find an optimum. However, optimum does not mean that the overswinger is eliminated.

## *Setting of ki*

In order to compensate the input offset of the speed controller, an I-part can be added. This is required, especially then, when the position precision in the bearing control is not sufficient. Here it must be considered that they can change as consequence of temperature and long-term conditions. Also kj must be calculated experimentally. Realistic values range between 0.1 and 100. The values are increased slowly. Stability and transient response may not be deteriorated.

## *Taking over the value into the file SYSTEM.DAT*

After finding the optimal settings, the found values must be saved. Hereto click firstly on the button „Update System Data“. Herewith the values are taken over into the window „System Data“. Afterwards this window must be opened for example with Ctrl-S. Now you can save it for example by clicking on the floppy disk icon. Herewith the values will be saved in SYSTEM.DAT and are available for the next session or application.