

FAQ for 6RA70 DC-MASTER and SIMOREG CM

Question: How can I optimize the speed controller according to the mechanics and the application?

Answer:

a) Automatic optimization of the speed controller with P051 = 26

Prior to optimizing the controller, set the required dynamic response of the speed control loop with P236 (maximum dynamic response = 100%).

Guide values:

If the controller mechanics are optimal, you can set 100%.

If there is gear backlash: P236 = approx. 40%. In this case, you should also activate gearbox protection with P157 = 0 and P158 = approx. 0.04 s. This causes a ramp function generator to be activated for the current setpoint when the torque direction is reversed, in order to reduce the torque surges in the gear at the tooth flank changes. Alternatively, you can set P157 = 1 and P158 = 0.04, in which case the ramp function generator is activated whenever the current setpoint is changed. This has the additional advantage of protecting the motor commutator.

For belt drives, set P236 = approx. 30% (refer to b)).

If the speed controller is optimized under load, both the motor inertia and the load are taken into account.

Note for drive control experts: The symmetrical optimum method of optimization is used (see example below).

b) Optimization with P051 = 29 if the speed controller has oscillating mechanics

Oscillating mechanics are characterized by a two-mass system coupled via a flexible transmission element, e.g. a torsionally flexible coupling, a load coupled via a long torsional shaft, or a belt drive.

The specific adaptation of the speed controller characteristics which is necessary for this purpose is determined with P051 = 29. This optimization method must always take place under load.

Please read the warning in section 7 of the operating manual first!

c) Manual optimization of the speed controller

If the required speed control behavior cannot be achieved with the measures described above, the controller must be manually optimized by setting the proportional gain K_p (P225) and the reset time T_n (P226).

To do this, operate the drive with 20% of the speed setpoint, for instance, set a setpoint step change of approximately 5% and monitor the rise time response with the DriveMonitor Trace function. The values of P225 and P226 are only correct if the drive current limit is not reached. Set a smaller setpoint step change if necessary. The transient response should be as shown below.

The actual speed must never oscillate periodically and the gear must never chatter. If so, P225 must be reduced and P226 possibly increased.

If necessary, set a short actual speed filter time of 0 to 50 ms with P200 for a pulse encoder or an analog tachometer, or approximately 40 ms for EMF control.

The reset time of the speed controller P226 should not be less than four times the reset time of the current controller P156.

The following values can be taken as a guide:

Crane drives:

P225 = 7 - 11, P226 = 0.2 - 0.4 s

Drives with large masses (main drive of a printing press, drying section of a paper machine):

P225 = 20 - 30, P226 = 0.6 - 1.0 s

Cutters (good mechanics are essential):

P225 = 25 - >30, P226 = 0.1 - 0.2 s

Extruders, rolling mills:

P225 = 5 - 10, P226 = 0.4 - 0.6 s

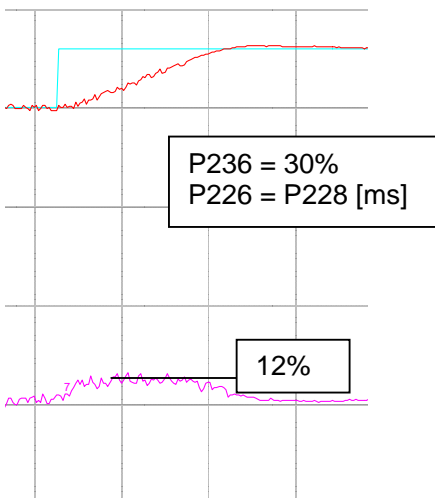
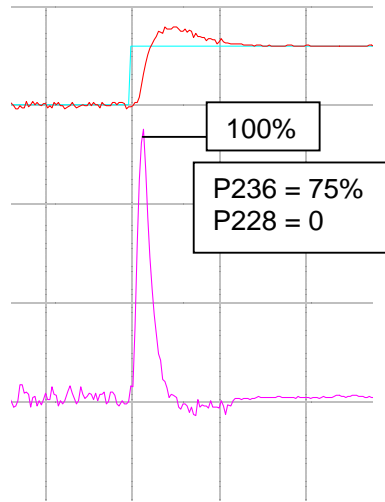
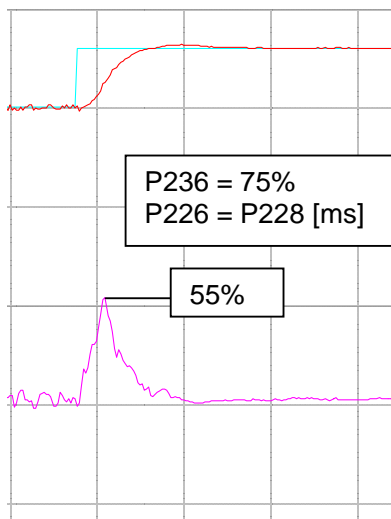
Positioning tasks (e.g. crane travel gear synchronization):

P225 = 5 - 10, P226 = 0.2 s

Condition: Converter rated current = 1.5 x motor rated current.

K_p must be proportionally reduced if the converter/motor ratio exceeds 1.5.

Example: Rise time response of the actual speed for a speed setpoint step change



Setpoint step change: 15% to 18%

n-set

n-act

i-act

Automatic speed controller optimization with P236 = 75% and P236 = 30%
n setpoint filtered with P228 immediately after the reset time
P226 prevents overshoot of n actual value

Recorded with the trace memory.

The square wave generator (section 8 of the operating manual, function diagram G128) was used as a speed setpoint generator with the following settings:

P480 = 15; P481 = 0.5; P482 = 18; P483 = 0.5; P485 = 1; P433 = 208; P303 - P306 = 0.

The setpoint step change should not be so large that the speed controller output is limited.

Note: The automatic speed controller optimization with P051 = 26 limits the Kp (P225) of the speed controller to a maximum value of 30.