

PID Controller

NV4SCRIPT Example

System Requirements

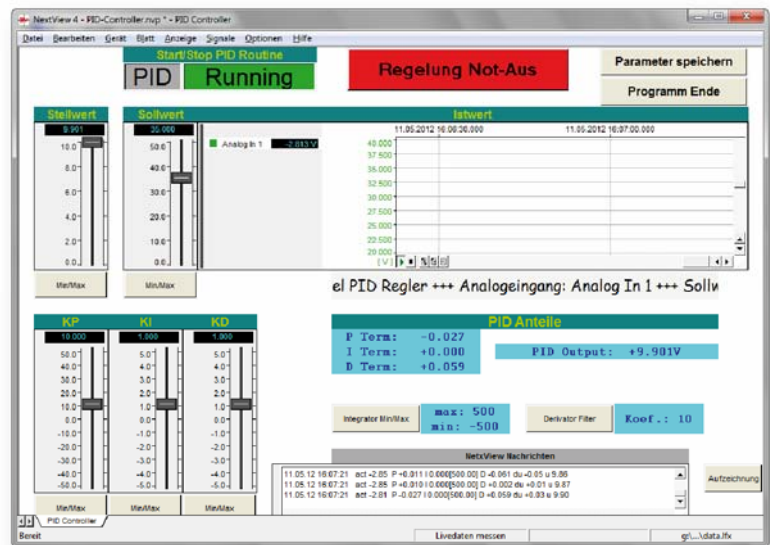
- DAQ system with 1x AIn, 1x AOut (example created with USB-AD16f and 16 formula channels)
- Miscellaneous:
e-mail connection via SMTP server

Software

- NextView®4 Professional
- NextView®4 Script
- Version: 4.6 and higher

System Configuration

- Live data frequency: 10Hz (depending on DAQ system and scan settings)



Description

The script example "PID Controller" demonstrates the implementation of a PID controller for simple control processes. The PID controller (proportional–integral–derivative controller) is a universal, typical control circuit widely used in industrial control systems. It consists of the components of the P parameter (proportional term), the I parameter (integrating term), and the D parameter (derivative term).

The deviation $e(t)$ of the control variable results from the measured actual value and the desired value of the control variable. The calculated proportional, integral, and differential terms are added to get the manipulated variable $u(t)$ of the PID controller. The correcting variable influences the controller output by reducing the deviation to a minimum in steady state.

1 Quickstart

1.1 Start Script Example

The configuration (*.nvc), project (*.nvp), and script files (*.nvs) of the script example have been installed in the folder "Script Examples" together with the external programs used. They are available in the following directory (if default settings have been used).

- **Windows® 7/8:** C:\Users\\My Documents\My NextView Projects\Script Examples
- **Windows® XP:** C:\Documents and Settings\\My Documents\My NextView Projects\Script Examples

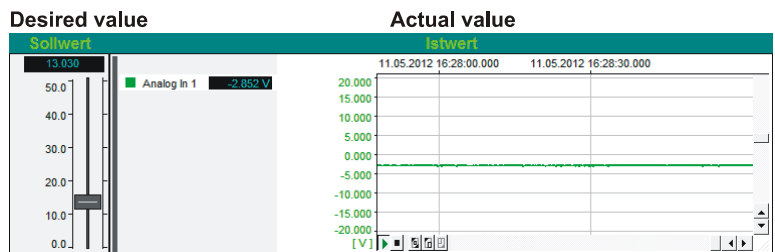
If using default settings during installation, the script example PID-Controller.nvp can be opened via the Windows® 7/XP Start menu or the Windows® 8 Start screen as follows:

- **Windows® 7/XP:** Start / (All) Programs / NextView 4.6 / Script Examples / PID Controller
- **Windows® 8:** Right-click Start screen / "All Apps" / NextView 4.6 / PID Controller

1.2 Controller Settings

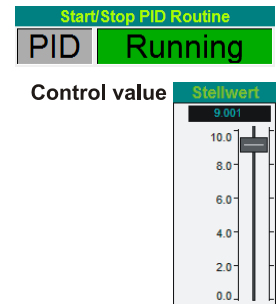
The slider "Sollwert" is used to set the desired value for analog input 1.

The actual values of the analog input are shown in the live display.

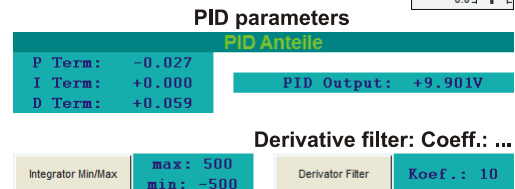


The PID controller is activated by pressing the top left button "PID". The text field aside indicates if the controller is on ("Running") or off ("STOPPED").

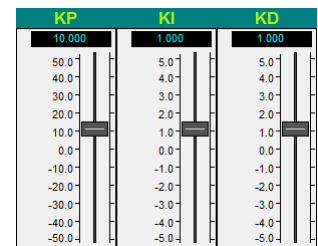
If the PID controller is off, the slider "Stellwert" connected to analog output 1 can be used to test the reaction of the system to control value changes. As soon as the PID controller has been turned on, the control value cannot be changed manually anymore but is regulated by the controller. This value is displayed as "PID Output" in the section "PID parameters" as well as the values for the P, I, and D terms.



To reduce the influence of the integrator, limiting values can be defined for it via the button "Integrator Min/Max". Digital filtering is set via the button "Derivator Filter" (Derivative filter) to prevent noise. The higher the coefficient, the stronger is the filtering. If the value is 0, filtering is turned off.

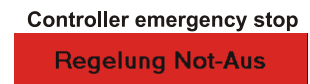


Coefficient modifications of the P, I, D terms are done via the sliders "KP", "KI", and "KD". If the sliders "KI" and "KD" are reset to 0, the PID controller acts as a simple proportional controller.



The lower/upper value for the displayed scale can be defined for the sliders via the corresponding buttons "Min/Max".

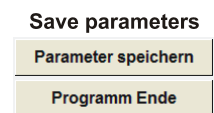
The "Regelung Not-Aus" switch (controller emergency stop) disables the PID controller and sets the control value to the preset minimum of the control value slider.



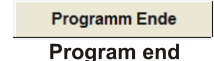
Actual, desired, and control value, deviation, P, I, D terms and coefficients can be recorded for analysis purposes while controlling is on. They are saved in a PID-*.csv file in the same directory.



If the top right button is pressed, set parameters will be saved in the file PID.ini and be used at the next start of the project.



To exit the program, the button "Programm Ende" is pressed.



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