

Drive Electronics pQ 04



Digital amplifier card for proportional directional control valves

Output current for solenoids:

800 mA/1600 mA/2400 mA

Catalog Register
A17, P17, H17

Publication 7503188.06.06.96



Description

Design

The digital amplifier card pQ 04 is used to control proportional pressure valves and proportional directional control valves. It contains a microcontroller with a high computer power taking over all functions for open and closed loop control. The characteristic functions of the system are determined by the employed software. By means of optionally available controllers it is possible to set up control loops, e.g. for pressure control.

Different amplifier versions are available to handle a large range of applications. Accessories include potentiometers for adjustment of the setpoints, PCB mounts, power packs, testing instruments and actual value sensors.



Function

The digital amplifier card pQ 04 supplies a direct current for control of proportional solenoids. The current is proportional to a setpoint at the input of the amplifier. In conjunction with a proportional valve it is possible to adjust the pressure or the flow volume to any desired value.

In order to improve the characteristics of the hysteresis, a hum signal may be superimposed on the solenoid current. The user can define the operating range of a given valve characteristic in setpoint terms by means of the zeroing function, drive limitation and linearization of the characteristics. By means of the ramp shaper it is possible to realize rise and fall-off functions. The parameters are adjusted via a data-entry keyboard at the front side of the card or by means of a PC or laptop via a serial interface. Operating conditions and actual electric variables are indicated by diodes or a digital display.



Features

- Digital drive electronics
- Reproducible input of parameters
- Programming of parameters by means of PC or laptop
- Integrated measuring function
- Optodecoupled in and outputs

The electronic amplifier card pQ 04 is offered with and without operating and indicating elements on the front side:

pQ04-T

Version with indicating and operating elements. The parameters are adjusted by means of 4 input keys on the front panel. LEDs on the front panel indicate the programmed parameters, faults as well as the operating state.

pQ04-S

Version with indicating and operating elements. Operation is effected via a serial interface by the PC or laptop or via the plug-in type programming unit PM 04 (to be ordered separately, please see accessories on Page 3)

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Parameters

General parameters

| | | | |
|------------------------------------|---|-----------------------------|--|
| Designation | Drive electronics pQ04 | | |
| Design | Amplifier with constant current regulator PDM | | |
| Mounting position | Upright, free air circulation must be ensured | | |
| Ambient temperature range | °C | 0 ... +50 | |
| Storage temperature | °C | -20 ... +60 | |
| Weight | [kg] | 0.40 | |
| Space requirement in 19" card rack | [mm] | Euroformat 100 x 160 | |
| Front panel | | 10TE/3HE | |
| Terminal strip | | 48-pin Form F to DIN 41 612 | |

Electromagnetic compatibility (EMV)

| | | | |
|----------------|---|--|--|
| Noise immunity | Burst of lines to EN 61000-4-4 Severity class A to EN 50082-2 | | |
| | HF-field to IEC 801-3 Severity class A to EN 50082-2 | | |
| | ESD to EN 61000-4-2 Severity class B to EN 50082-2 | | |
| Noise emission | Efficiency-dependent emission to EN 50011 Severity class A to EN 50081-2 | | |
| | Radiated emission to EN 50011 Severity class A to EN 50081-2 | | |

Electromagnetic parameters

Supply

| | | | | |
|-------------------|-------|------------------------------------|----|----|
| Supply voltage | [VDC] | 18 ... 30V (incl. residual ripple) | | |
| Residual ripple | [%] | < 10 | | |
| Power consumption | [VA] | 35 | 40 | 45 |

Proportional solenoid control

| | | | | |
|-------------------------------------|------|-------------------------------|------------|-------------|
| Solenoid output current | [mA] | 0 ... 800 | 0 ... 1600 | 0 ... 2400 |
| Solenoid resistance R ₂₀ | [Ω] | 2.5 ... 16 (21) ¹⁾ | 2.5 ... 7 | 2.5 ... 4.5 |

External setpoints

Setpoint S5:

| | | |
|---|------|-----------|
| Input resistance R _i | [kΩ] | 150 |
| Input voltage for solenoid A (optional) | [V] | 0 ... -10 |
| Input voltage for solenoid B (optional) | [V] | 0 ... +10 |

Setpoint S6: (Differential input potential-free)

| | | |
|---|------|-----------|
| Input resistance R _i | [kΩ] | 150 |
| Input voltage for solenoid A (optional) | [V] | 0 ... +10 |
| Input voltage for solenoid B (optional) | [V] | 0 ... -10 |

Digital controls inputs

Internal setpoints:

| | | |
|----------------------------------|------|---|
| Number (S1 ... S4) ²⁾ | Pcs. | 4 |
|----------------------------------|------|---|

Directional control ± (for selection of solenoid A or B)

Resetting of ramp (quick stop)

Enabling of output stages

| | | |
|-----------------|-------|----------|
| Drive voltage | [VDC] | 24 ± 10% |
| Current | [mA] | 20 |
| Residual ripple | [%] | < 10 |

Outputs for supply of setpoint adjusters and actual value sensors

| | | |
|----------------|------|-----|
| Output voltage | [V] | 10 |
| Output current | [mA] | 10 |
| Output voltage | [V] | -10 |
| Output current | [mA] | 10 |

Output/Fault

| | | |
|---------------------|------|-----------|
| Output voltage | [V] | UB - 0.7V |
| Output current max. | [mA] | 50 |

¹⁾ Note: For output voltage ≥ 24 V

²⁾ Set values add up when selecting several setpoints at the same time.

Output/Comparator

| | | |
|---------------------|------|-----------|
| Output voltage | [V] | UB – 0.7V |
| Output current max. | [mA] | 50 |

Setting parameters

| | | |
|---------------------------------------|------------|-----------|
| Zero-point jump for solenoids A and B | [% I max.] | 0 ... 100 |
| Zero-point shift for solenoid A and B | [% I max.] | 0 ... 23 |
| Drive limitation for solenoid A and B | [% I max.] | 0 ... 100 |
| Dither (amplitude) | [% I max.] | 0 ... 30 |
| Dither frequency | [Hz] | 0 ... 647 |

Ramp shaper

| | | |
|-----------|-----|------------|
| Ramp time | [s] | 0 ... 39.5 |
|-----------|-----|------------|

Serial interface

| | | |
|-------------------|--------|---------------------------------------|
| | | RS 232 C |
| Interface 1 | | SUB-D 9-pin front panel |
| Interface 2 | | at terminal strip |
| Voltage level | [V] | 12 |
| Transmission rate | [Baud] | 9600 |
| Data format | | 8 data bits, 1 stop bit. Parity: None |

Equipment survey (standard units)

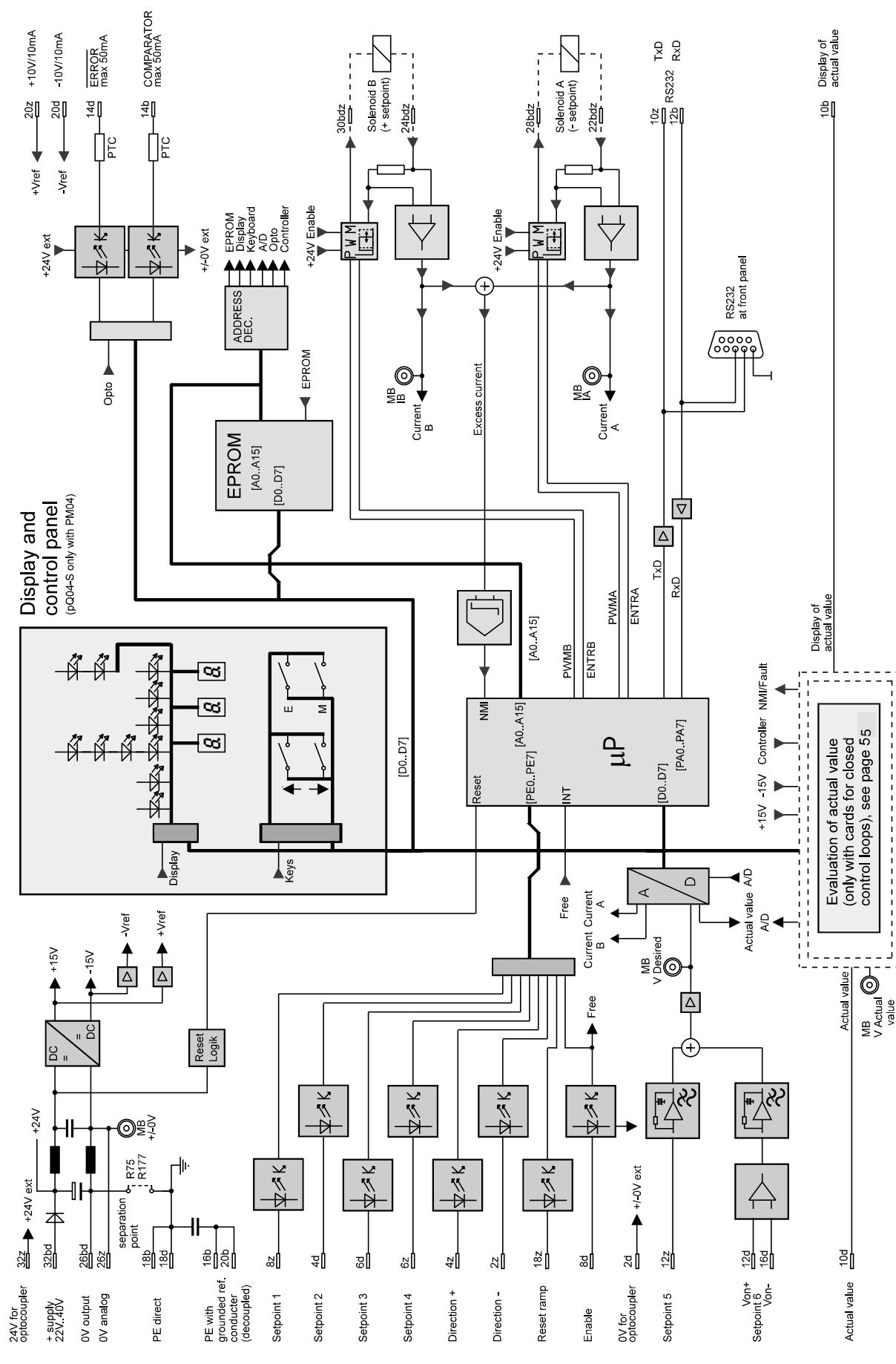
| Type | Front keyboard | Controller card Free setting of parameters | Cat. No. | |
|----------|----------------|---|---------------------|----------------------|
| | | | For valve type S6UR | For valve type S10UR |
| pQ04 – S | ○ | ○ | ○ | ○ |
| pQ04 – T | ● | ○ | ○ | ○ |
| pQ04 – S | ○ | ● | ○ | ○ |
| pQ04 – T | ● | ● | ○ | ○ |
| pQ04 – S | ○ | ○ | ● | ○ |
| pQ04 – T | ● | ○ | ● | ○ |
| pQ04 – S | ○ | ○ | ○ | ● |
| pQ04 – T | ● | ○ | ○ | ● |

Mark in table: ○ = without, ● = with

Accessories

| Description | Specification | Cat. No. |
|----------------------------|---|----------|
| Programming unit PM 04 | Mounts on amplifier without front panel For programming and measuring | 5988018 |
| Operating program pQ04SOFT | Presentation, documentation, change, storage and loading of parameters (PC or laptop) | 5988030 |
| PCB mount KT 11 | 48-pin, with terminal connection 2.5 mm ² , for mounting of pQ 04 on mounting plate | 5998540 |
| Zero-modem cable | For connection to PC via serial interface | 0681774 |

Block diagram of hardware



Controller (option)

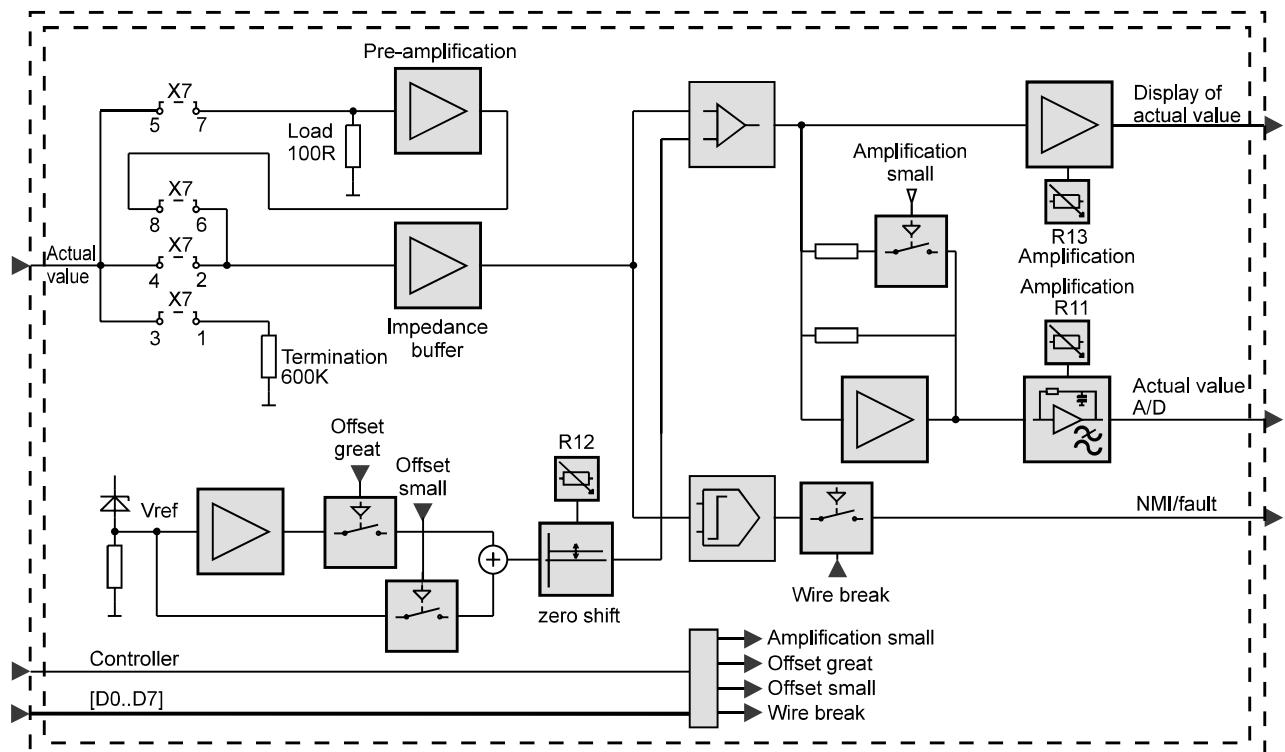
Description

The controller module is suited for control of physical variables such as pressure, flow rate, position etc. This variable is to be measured by the user via a corresponding sensor with electrical output signal (actual value) and applied to the actual value input. The controller compares the actual value variable with the reference variable (set-point). The deviation X – W is supplied to the subsequent PI controller. The output signal of the controller serves as corrective signal for the output stage of the electronic amplifier pQ 04.

The parameters for adjustment to the actual value and P-, I- and D-controllers are programmable. For all HERION hydraulic directional control valves with displacement sensors (Type S6UR or S10UR), these parameters, however, are programmed by the factory prior to delivery. If desired, a comparator (threshold switch) can be programmed for the purpose of monitoring. Furthermore, it is possible to program an evaluation for monitoring of cable break.

Block diagram for evaluation of the actual value

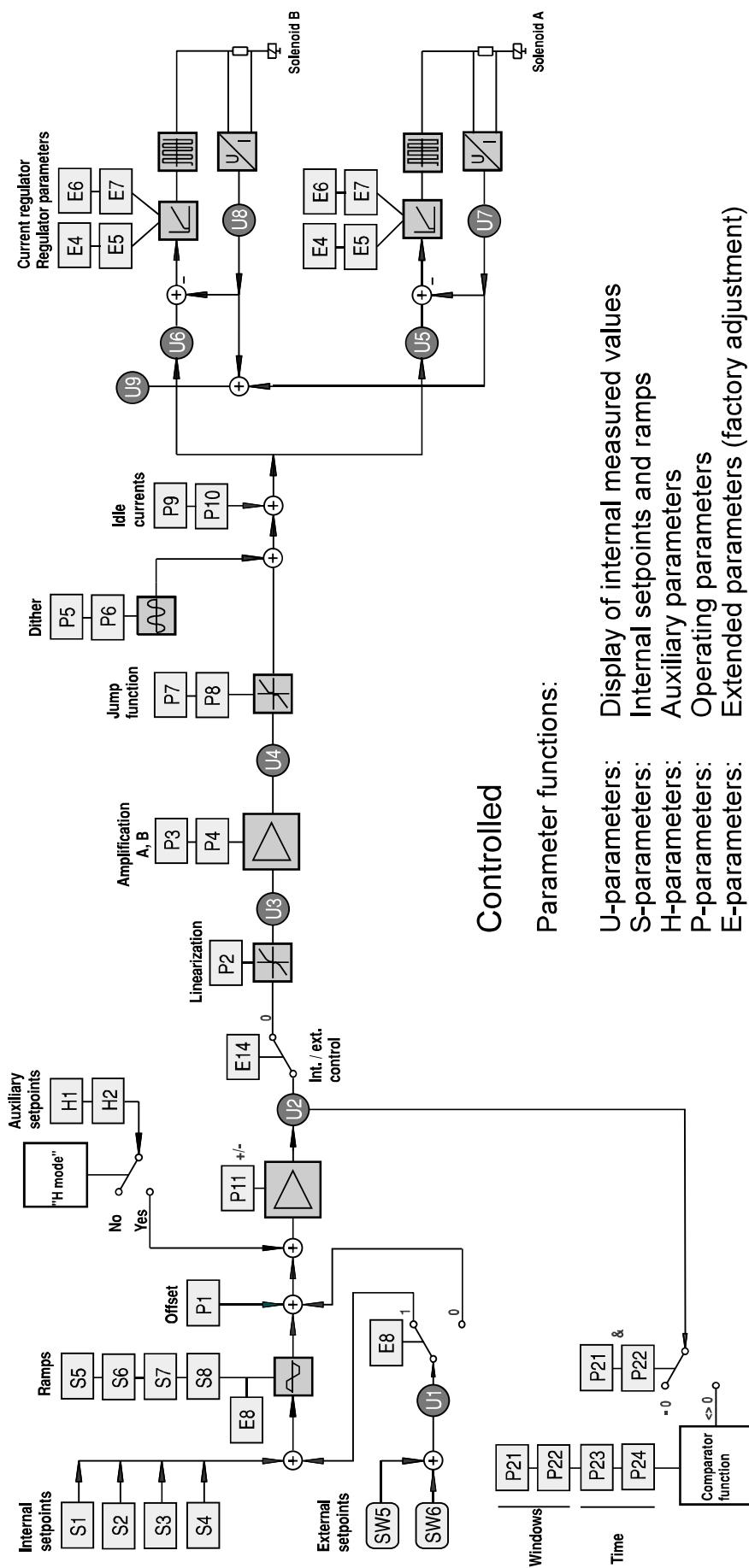
(Hardware. Only suitable for PCBs designed for closed control loops).



| Input/Actual value X | | Zero | |
|---------------------------|------|--------------|-----|
| Voltage signals | [V] | 0 ... 10 | 0 |
| | | 0 ... ± 10 | 0 |
| | | 2.4 ... 7.6 | 5 |
| | | 3.6 ... 11.4 | 7.5 |
| Input resistance R_i | [kΩ] | 600 | |
| Current signals | [mA] | 0 ... 20 | 0 |
| | | 4 ... 20 | 4 |
| Input resistance R_i | [Ω] | 100 | |
| Dynamic systems behaviour | | PID | |

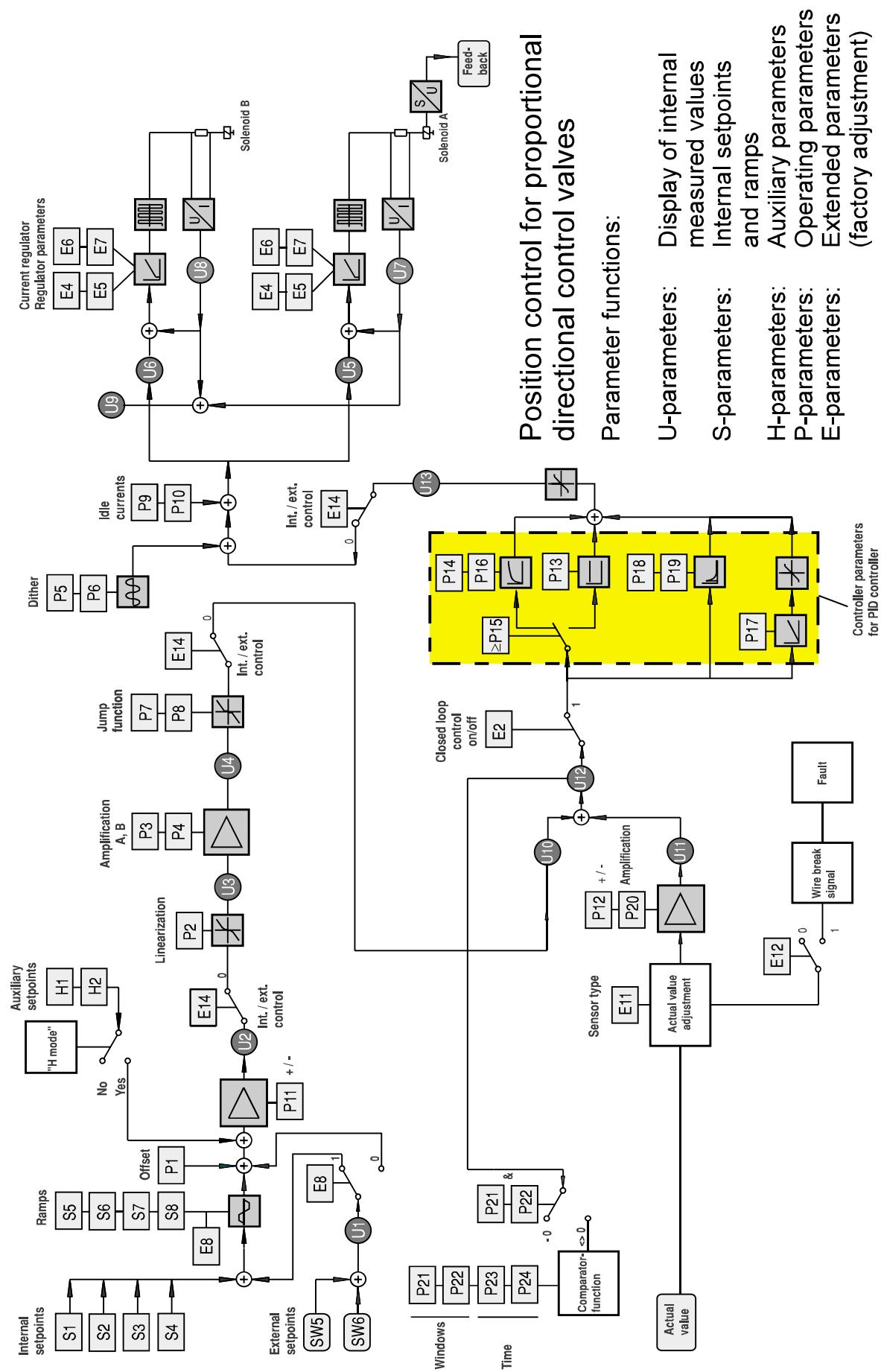
Block diagram/Software functions

Controlled operation



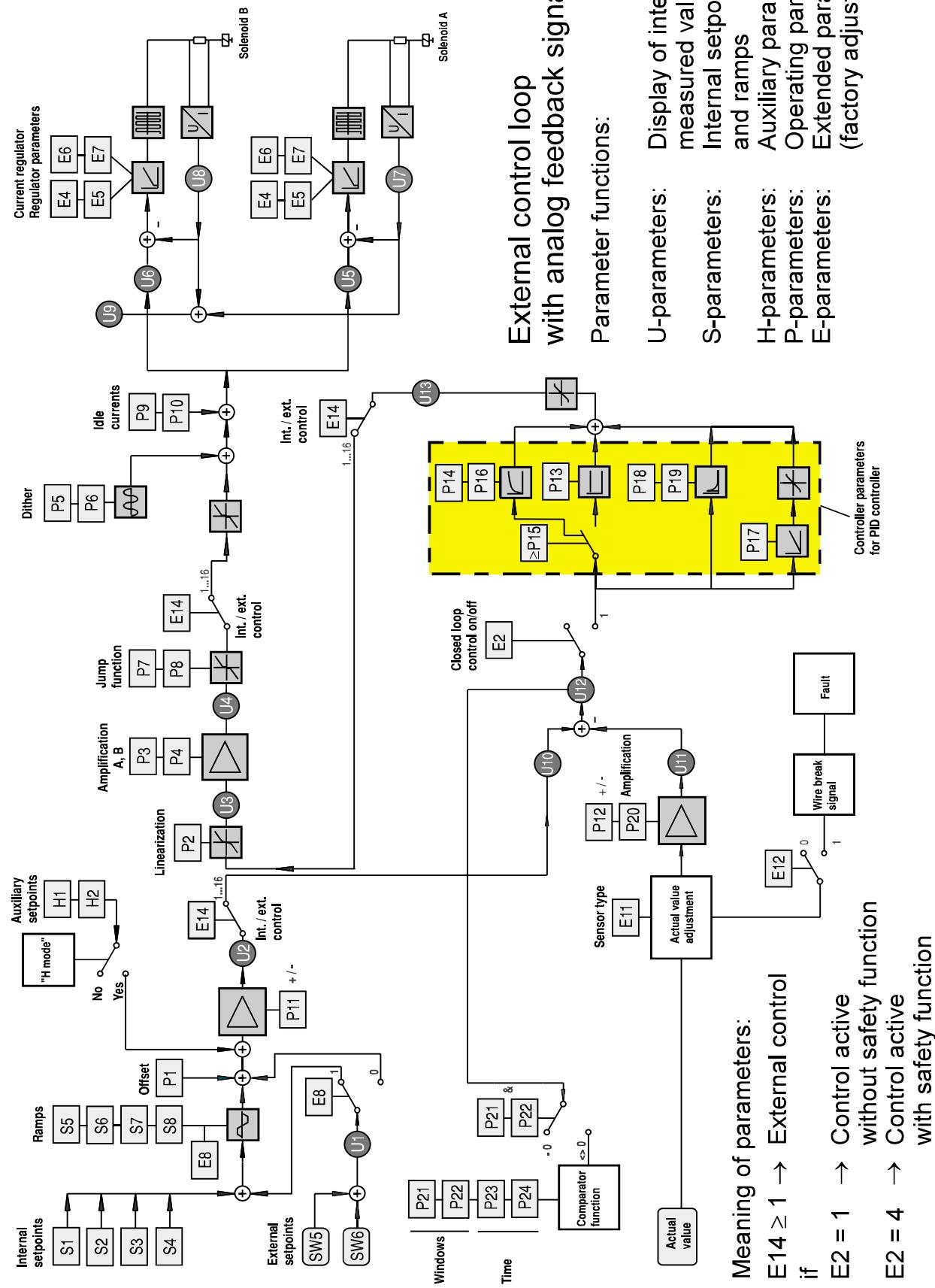
Position control for proportional valves with displacement sensors

(only with card designs for control loops)



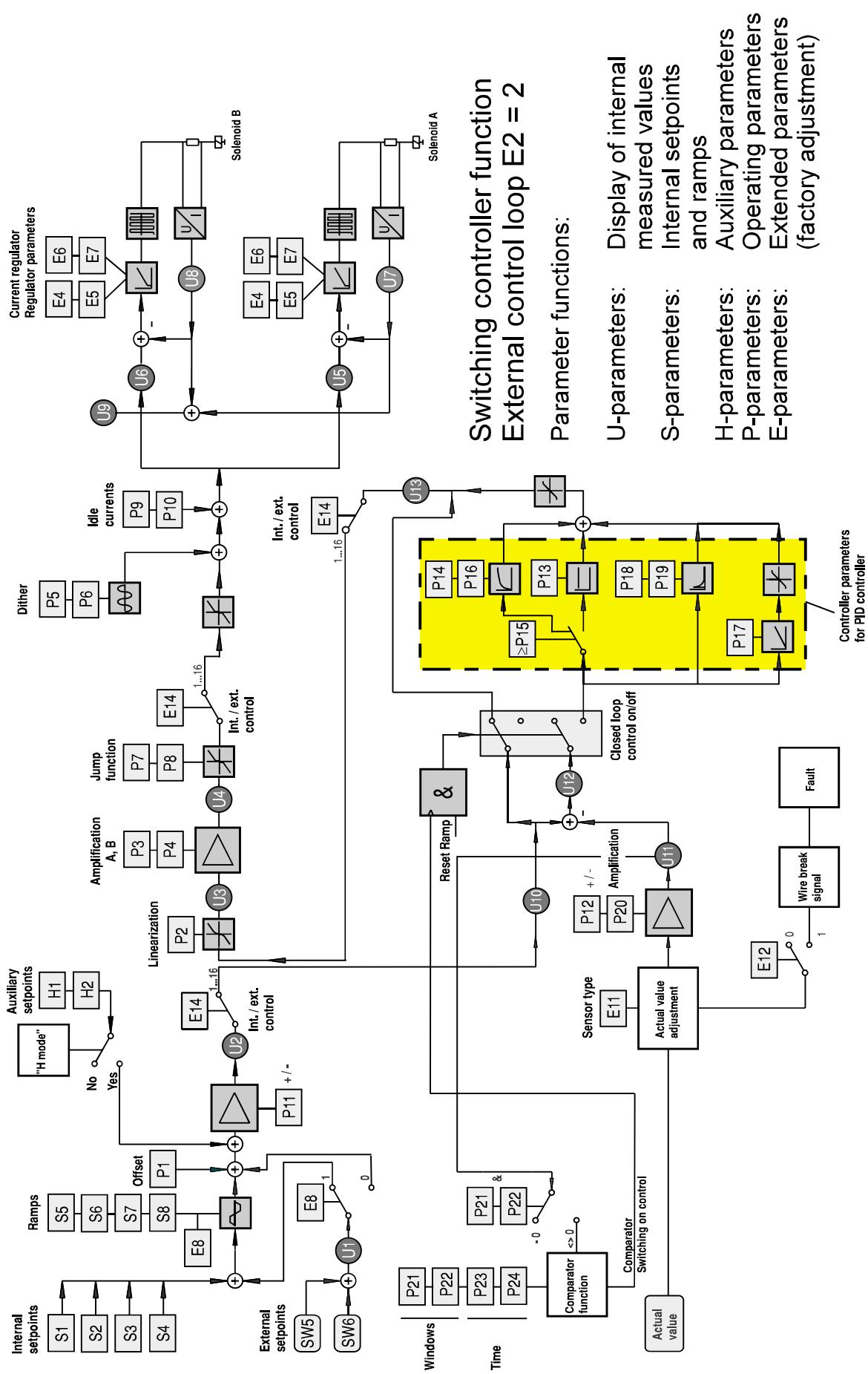
External control

(only with card designs for control loops)



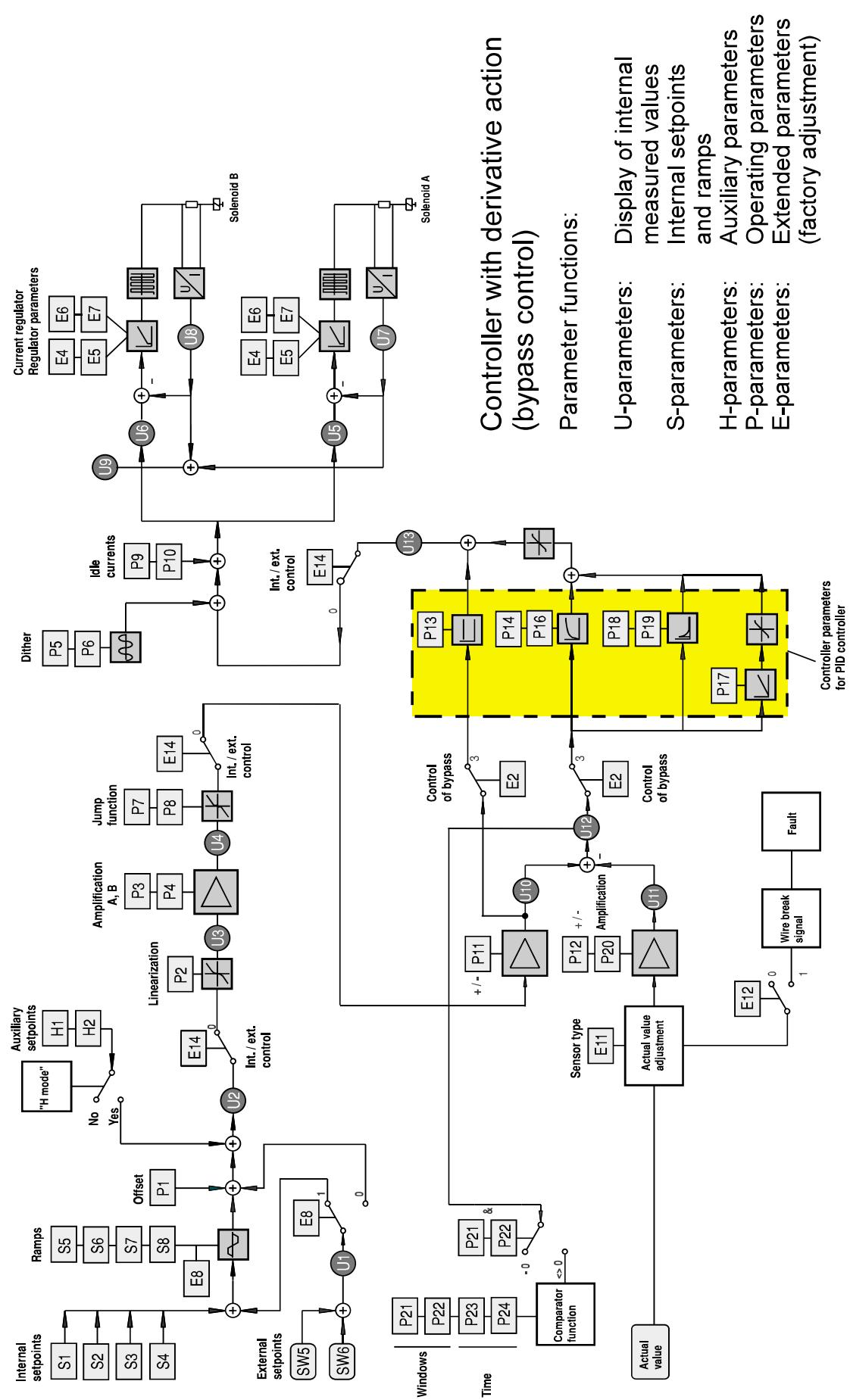
Switching controller

(only with card designs for control loops)



Controller with derivative action

(only with card designs for control loops)



pQ04SOFT

For programming of drive electronics pQ04 on PC or laptop

General

The program pQ04SOFT serves for communication between drive electronics pQ04 and PC. It enables a comfortable change of all parameters which are available on the amplifier card. Furthermore, these parameters can be saved in external storage devices or loaded into the pQ04 memory unit.

Function

The communication between PC and drive electronics pQ04 is carried out via the serial interface RS 232. Special adapter cables for the connection are available. The program is controlled via a menu line and an SAA-standard pull-down menu. Thanks to an extensive help system, operation is possible without the use of a manual. The user can prepare an individual program configuration (color, audible alarm, password etc.). By means of the pQ04SOFT program it is also possible to change parameters that have been programmed by the factory and are not accessible via the keyboard on the front panel of the pQ04 amplifier. Functions of the pQ04 amplifier can be adjusted more effectively to the particular application. This branch of program is protected by a password in order to prevent a change by mistake or by unauthorized persons.

System environment

The program pQ04SOFT has been created for IBM-compatible PCs and can be run on XT, AT, PS/2 models, etc.

Minimum requirements:

Memory: 512 kByte RAM

Operating system: PC-DOS or MS-DOS 3.30 or higher.

Video adapter for at least 80 characters per line.

Scope of delivery:

1.44 MB diskette 3.5 ", with program data sets as well as parameter and auxiliary data sets.