

Software module for pressure/flow control in hydraulic circuit

H4U.app pQ



- ▶ PLC function block for pressure/flow control (p/Q) in the hydraulic circuit with fixed displacement or variable displacement pumps
- ▶ For Siemens and Beckhoff control systems
- ▶ Uniform functionality in all automation systems
- ▶ Different control concepts

Features

- ▶ Pressure control
- ▶ Flow control
- ▶ Alternating control
- ▶ Controller structure as cascade or parallel
- ▶ Leakage compensation
- ▶ Power limitation
- ▶ For internal gear pumps type PGH and PGF
- ▶ For axial piston pumps type A4VSO, A4VBO, A10VZO, A10VSO and A10FZO
- ▶ Component database included

Contents

Features	1
Ordering code	2
Function	3
Basic standard applications	4 ... 6
Technical data	7
Controller function	8, 9
Further information	10

Ordering code

► Software

01	02	03	04	05	06	07	08							
SWA-HYD	-	T	-	PQ**	-		-	01	-	RS	-	NN	-	N

01	Software for hydraulic applications	SWA-HYD
02	Technology library	T

Category

03	Pressure/flow control	PQ**
----	-----------------------	------

Target system

04	Siemens TIA Portal	TIA*
	Beckhoff TwinCAT 3	TC3*
05	Version 01	01
06	Release RS	RS
07	Patch	NN

Export indicator

08	Standard	N
----	----------	---

Target system	PLC runtime system	Recommended control hardware ¹⁾
Siemens	TIA Portal (as of version 15)	SIMATIC S7-1500
Beckhoff	TwinCAT 3	Embedded PC series CX5100, CX8100

¹⁾ The PLC runtime system is a prerequisite for the use of the software. Selection of suitable control hardware depends on the specific application and is determined by the user.

► Software license

01	02	03	04	05	06	07						
SWL-HYD	-	T	-	PQ	-	BASIC*M01*	-	01	-	P01	-	

01	Software license for hydraulic applications	SWL-HYD
02	Technology library	T

Category

03	Pressure/flow control	PQ**
----	-----------------------	------

Scope of functions

04	Basis, number of controlled motor-pump combinations: 1	BASIC*M01*
----	--	------------

Version

05	01	01
06	Permanent license, 1 license activation	P01

Target system

07	Siemens TIA Portal	TIA*
	Beckhoff TwinCAT 3	TC3*

Function

The "H4U.app pQ" software module controls the pressure (p) or the flow (Q) of a hydraulic system.

It is used for the control of fixed displacement and variable displacement pumps. For control concepts with variable pump speeds, a frequency converter is required to drive the motor.

The software module can be integrated directly into the PLC application of the existing machine control system. Based on the performance data of the motor and the pump, the software determines the limiting values for the control. Operating state monitoring ensures that the pump is operated within the admissible operating limits. For faster parameterization, predefined data sets with technical parameters are available for Rexroth pumps.

These are directly applied as data structure in the PLC application.

Basic standard applications for pressure/flow control (p/Q) in hydraulic circuit

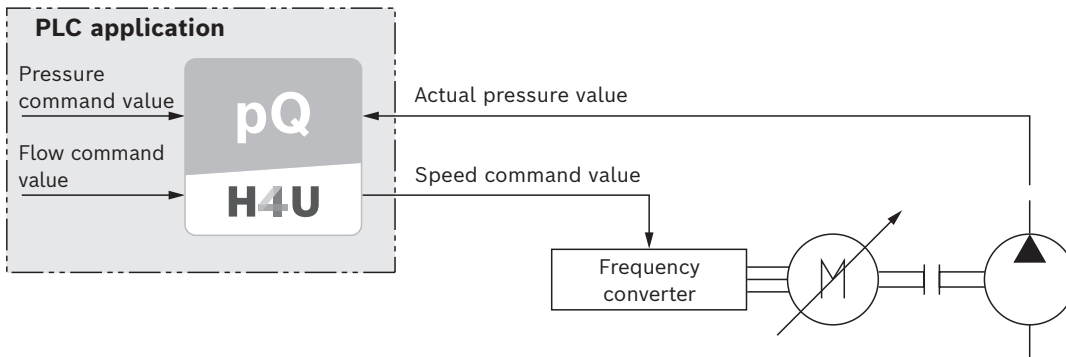
Fixed displacement pump with speed adjustment

(Type PGH, PGF and A10FZO)

For p/Q control systems with a fixed displacement pump as actuator, the "H4U.app pQ" software module receives the pressure and the flow command values from the PLC application. The fixed displacement pump supplies a flow (Q) proportional to the speed.

With this concept, the flow delivered by the pump into the hydraulic circuit is influenced via the speed control output in such a way that the desired flow or pressure is controlled.

The actual pressure value is read in for the control. The "H4U.app pQ" software module outputs the speed command value for the frequency converter as the control value.



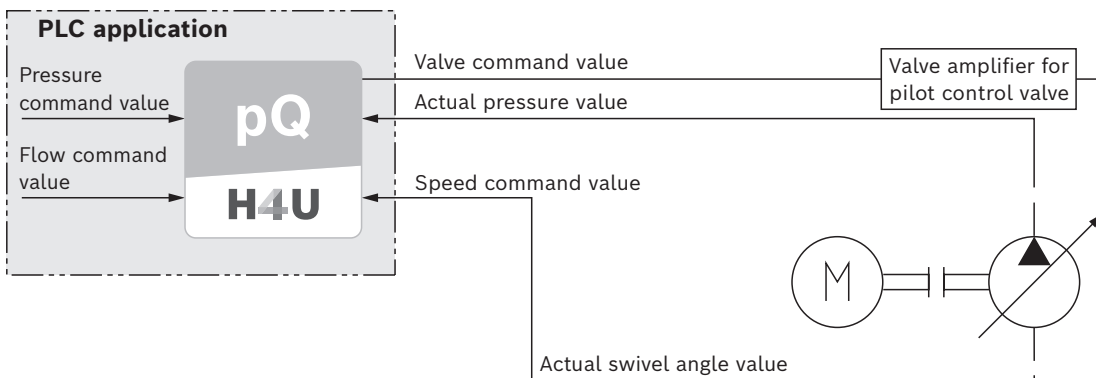
Variable displacement pump with continuous swivel angle adjustment at constant speed

(Type A4VSO, A4VBO and A10VSO)

For p/Q control systems with an axial piston pump as actuator, the "H4U.app pQ" software module receives the pressure and the flow command values from the PLC application. The axial piston pump delivers a flow (Q) proportional to the swivel angle.

With this concept, the flow delivered by the pump into the hydraulic circuit is controlled via the swivel angle control output.

For control, the actual pressure and actual swivel angle values are read. The "H4U.app pQ" software module outputs the valve command value for the pilot control valve of the axial piston pump as the control value.



Basic standard applications for pressure/flow control (p/Q) in hydraulic circuit

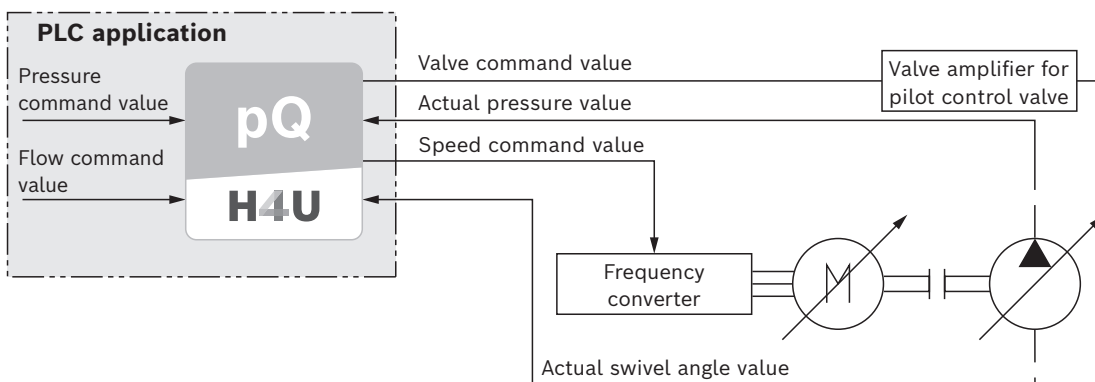
Variable displacement pump with continuous swivel angle and speed adjustment

(Type A4VSO, A4VBO and A10VSO)

For p/Q control systems with an axial piston pump as actuator, the "H4U.app pQ" software module receives the pressure and the flow command values from the PLC application. The axial piston pump supplies a continuously adjustable flow (Q), which is proportional to the swivel angle and the variable speed.

With this concept, the flow and the pressure are controlled by adjustment of the swivel angle. By adjusting the speed, the operating point of the pump is optimized for energy-efficient operation.

For control, the actual pressure and actual swivel angle values are read. The "H4U.app pQ" software module outputs the valve command value for the pilot control valve of the axial piston pump as the primary control value. The secondary control output is the speed command value for the frequency converter.



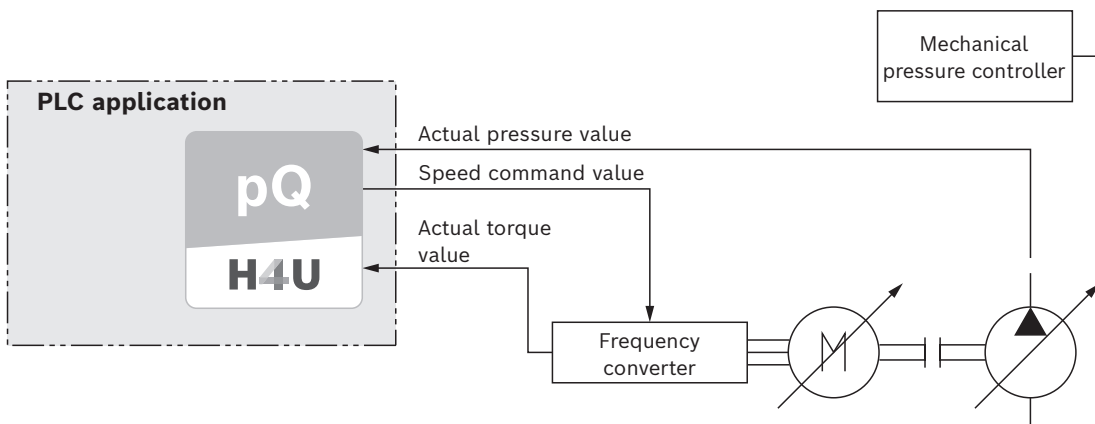
Variable displacement pump with mechanical pressure controller and speed adjustment

(Type A4VSO and A10VZO)

For p/Q control systems with an axial piston pump with hydromechanical pressure controller as actuator, the pressure is controlled by the pressure controller at the pump output. The pressure command value is set at the pressure controller.

With this concept, the flow and the pressure are controlled by the pressure controller by adjustment of the swivel angle. By adjusting the speed, the operating point of the pump is optimized for energy-efficient operation.

The actual pressure value is read in for the control. This requires the actual torque value or alternatively the preferred swivel angle for a specific displacement. The "H4U.app pQ" software module outputs the speed command value for the frequency converter as the control value.



Basic standard applications for pressure/flow control (p/Q) in hydraulic circuit

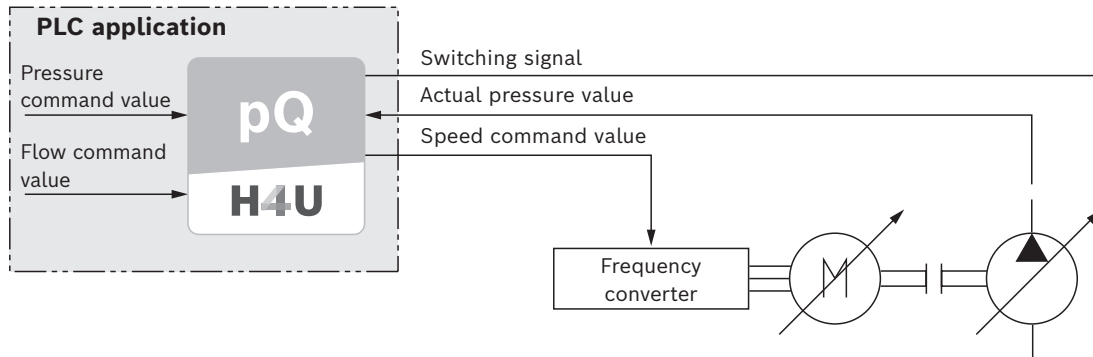
Variable displacement pump with two-point and speed adjustment (Type A4VSO and A10VZO)

For p/Q control systems with an axial piston pump with two-point adjustment type EZ as actuator, the "H4U.app pQ" software module receives the pressure and the flow command values from the PLC application.

With this concept, the minimum and maximum displacement of the pump required for the application is set and switched via a simple on/off valve. Adjustment of the speed during the switching process ensures a steady flow for smooth and jerk-free switching.

The actual pressure value is read in for the control.

The "H4U.app pQ" software module outputs the speed command value for the frequency converter as the primary control value. The secondary control output is the valve switching signal for two-point adjustment.



Technical data

pQ control		
Flow command value processing		✓
Pressure control		✓
Flow control		✓
Switchover p/Q		✓
Actuator adjustment		✓
Leakage compensation		✓
Control structure		Parallel; cascaded
Operating mode		Master/slave
Operating strategy		
Variable displacement pumps	► Variable-speed operation	✓
	► Two-point adjustment control	✓
Operating status control		
Operating limit determination		✓
Field weakening operation		✓
Operating state monitoring		
Internal gear pumps		PGH; PGF
Axial piston pumps		A10VZO; A10FZO
Component database		
Internal gear pumps		PGH; PGF
Axial piston pumps		A4VSO; A4VBO; A10VZO; A10VSO; A10FZO

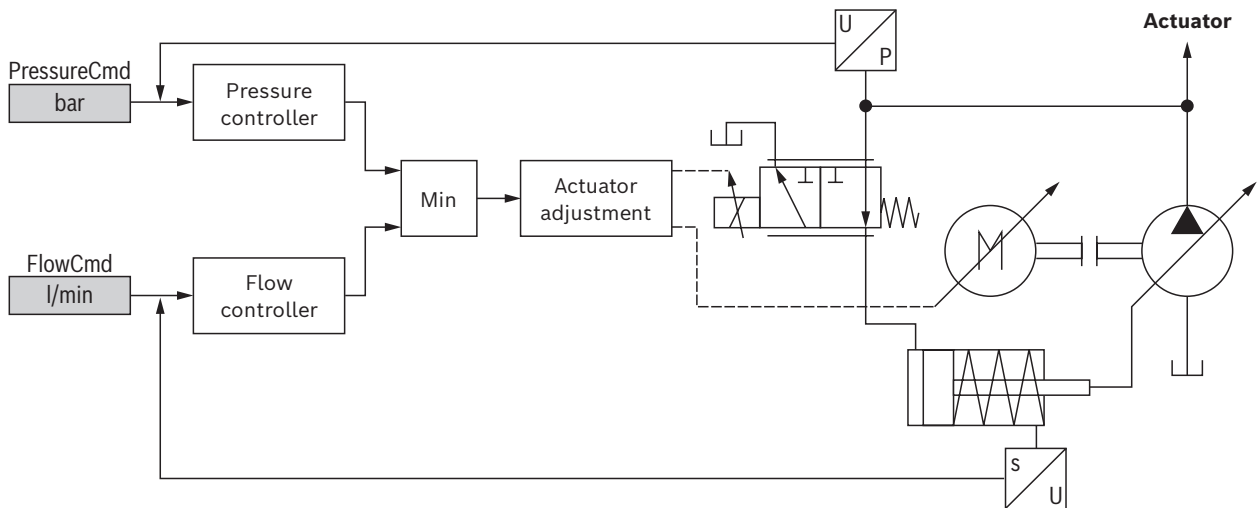
Controller function

The "H4U.app pQ" software module controls the pressure (p) or the flow (Q) of a hydraulic system. It includes an alternating control that switches between pressure and flow control without any control jerks depending on the load.

In order to optimally control the various operating states of a machine, the software module offers a controller structure that can be switched over at any time.

Parallel structure

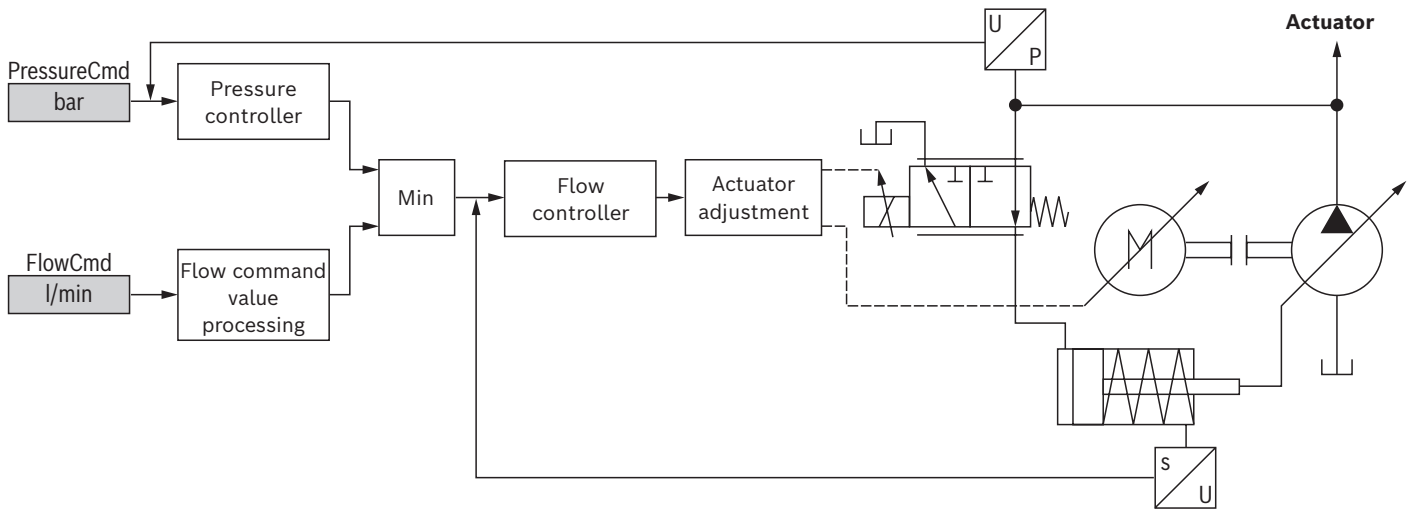
The parallel control loops of the pressure and flow controller process the two command values for pressure (PressureCmd) and flow (FlowCmd) into two control values. Switchover between pressure (p) and flow (Q) control is performed by a minimum value generator, which passes on the smaller control value to actuator adjustment in each case. Depending on the system topology, the speed command value and the valve control value are generated here.



Controller function

Cascaded structure

Pressure and flow controllers are connected in series as a cascade. The pressure controller and flow command value processing are simultaneously active and deliver both a flow command value. Switchover between pressure (p) and flow (Q) control is performed by a minimum value generator, which passes on the smaller control value to the flow controller in each case. Depending on the system topology, the speed command value and the valve control value are generated here.



Further information

- ▶ Function block H4U.app Pressure Flow
- ▶ Function block H4U.app Pressure Flow for Beckhoff TwinCAT 3
- ▶ Function block H4U.app Pressure Flow for Siemens TIA Portal
- ▶ Internal gear pump, fixed displacement; type PGH
- ▶ Internal gear pump; type PGF
- ▶ Axial piston variable displacement pump; type A10VSO
- ▶ Axial piston variable displacement pump; type A4VSO
- ▶ Axial piston variable displacement pump; type A10VZO
- ▶ Axial piston variable displacement pump; type A4VBO
- ▶ Axial piston fixed displacement pump; type A10FZO
- ▶ Pressure and flow controller; type DR

Functional description 01936-FK

Quick start guide 01936-01-Z

Quick start guide 01936-02-Z

Data sheet 10227

Data sheet 10213

Data sheet 92711, 92714

Data sheet 92050

Data sheet 91485

Data sheet 92122

Data sheet 91485

Data sheet 92060

Notes

Notes

Bosch Rexroth AG
Industrial Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Phone +49 (0) 93 52/40 30 20
my.support@boschrexroth.com
www.boschrexroth.com

© All rights reserved to Bosch Rexroth AG, also regarding any disposal, exploitation, reproduction, editing, distribution, as well as in the event of applications for industrial property rights.
The data specified above only serve to describe the product. No statements concerning a certain condition or suitability for a certain application can be derived from our information. The information given does not release the user from the obligation of own judgment and verification.
It must be remembered that our products are subject to a natural process of wear and aging.