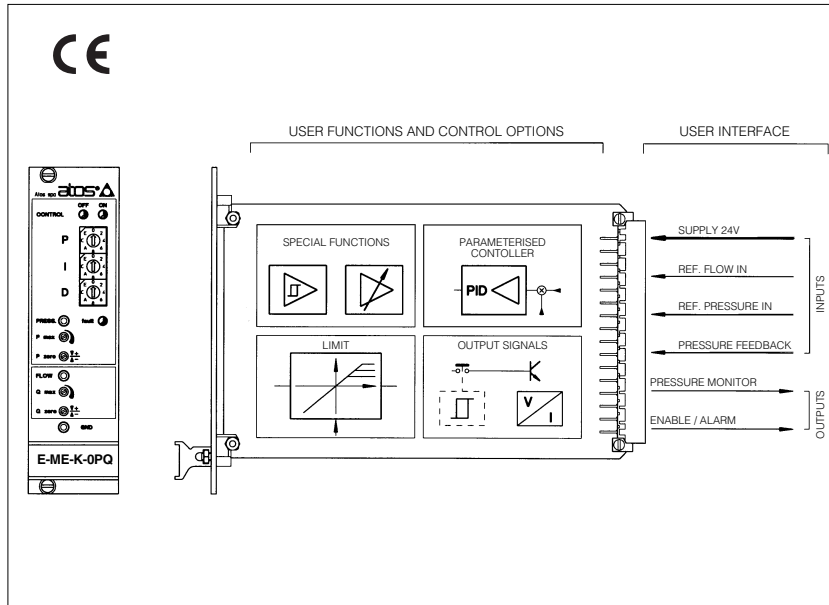


# Electronic controllers type E-ME-K-0PQ

Eurocard format, for flow and pressure controls in closed loop systems



E-ME-K-0PQ electronic controllers are designed to perform both flow control in open loop and pressure control in closed loop, coupled to variable displacement pumps or electrohydraulic actuators (cylinders).

The block diagram 2 describes the operation of the electronic controller connected to a pump type PVPC, with electronic control of the displacement, flow and pressure transducer.

The input reference signals to the controller are flow rate and pressure.

E-ME-K-0PQ perform the control in two different ways:

- open loop flow control, when the pressure reference is over the actual pressure value (detected by the transducer);
- closed loop pressure control, when actual pressure value is very close to the pressure reference. An error signal is generated, limiting the flow output signal from the E-ME-K-0PQ controller.

The controller has been engineered and developed with:

- enable signal for pressure control;
- monitor signal coming from the pressure feedback transducer;
- alarm signals, warning any damage on pressure transducer cable;
- pressure signal control operating led.

The above signals can be used to drive actuators, to synchronize other functions of the machine, and to monitor the status of the control.

The electronic card is in Eurocard format (employ only into modular unit DIN 41494 provided with proper EMC shield) and the power supply is 24 V<sub>dc</sub>.

To grant the conformity to the EMC directive (electromagnetic compatibility) the card features electronic filters on input and output lines and is CE marked.

## 1 MODEL CODE

**E - ME**      -      **K-0PQ**      **10**      /      **/\*\*\***

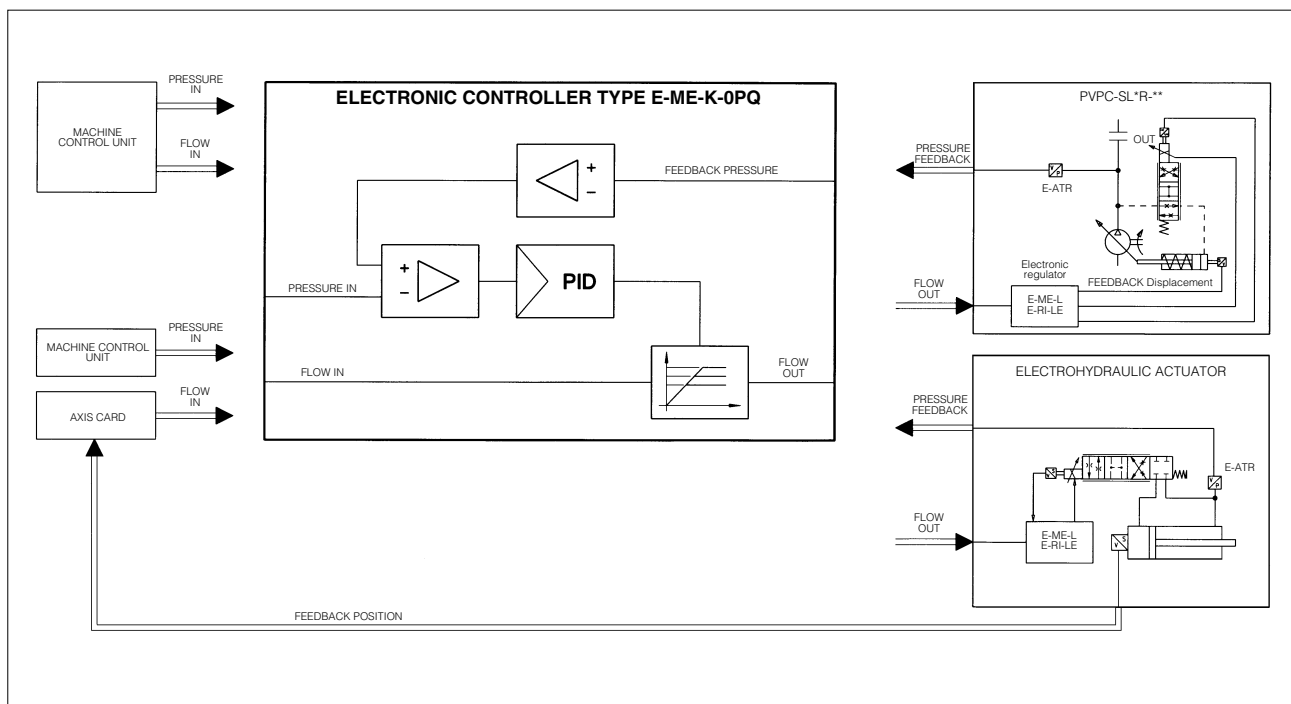
**E-ME** = Electronic card in Eurocard format

Possible set code

**K-0PQ** = Flow/pressure control module

Design number

## 2 BLOCK DIAGRAM



### 3 TECHNICAL SPECIFICATIONS OF E-ME-K-0PQ ELECTRONIC CONTROLLER

Power supply (positive contact 2a,2c) (negative contact 4a,4c)	Stabilized: Rectified and filtered (ripple max.= 3Vpp): Maximum peak:	24V <sub>DC</sub> ±10% V <sub>RMS</sub> = 21 ÷ 28 V <sub>p</sub> = 34V / 1ms
Average power consumption	5W	
Flow reference input Pressure reference input	Differential contacts 12c (V+) and 14c (V-): Differential contacts 26c (V+) and 24c (V-):	0 ÷ +10V (R <sub>i</sub> = 100KΩ) 0 ÷ +10V (R <sub>i</sub> = 100KΩ)
Pressure feedback input	Differential contacts 18c (V+) and 16c (V-): Otherwise on contacts 20c (V+) and 16c (V-):	0 ÷ +10V 0,5 ÷ +5,5V
Output to driver (control signal)	Contact 12a: -10V ÷ +10V	
Transducer monitor output	Contact 18a: 0 ÷ +10V	
Enable/disable the pressure control	Contact 22c: high (10÷34V); red led (CONTROL OFF) lit up: pressure control disabled Contact 22c: low (0V); red led (CONTROL OFF) not lit up: pressure control enabled	
Pressure control monitor	Green led (CONTROL ON) lit up: pressure control enabled - contact 28a low (0V) Green led (CONTROL ON) not lit up: pressure control disabled - contact 28a high ( ≥10V; 20mA max )	
Alarm signal: wire interruption on pressure transducer	Red led (FAULT) lit up: wire interruption - contact 14a low ( 0V ) Red led (FAULT) not lit up: wire o.k. - contact 14a high ( ≥10V; 20mA max)	
Supplies available to user	Contact 8c: +10V (10mA) max Contact 8a: -10V (10mA) max Contact 10c: +15V (30mA) max Contact 10a: -15V (30mA) max	
Card format	Europe 100 x 160mm (modular unit DIN 41496)	
Card connector	Male connector DIN 41642/D	
Available connections elements	Plug-in connector type E-K-32M or Eurocard Rack (see table G800)	
Operating temperature	0 ÷ +50 °C (storage -20 ÷ +70 °C)	
Front panel size	128,4 x 35,3 mm	
Weight	230 g	

### 4 GENERAL SPECIFICATIONS

#### 4.1 Power supply and wirings

The power supply must be appropriately stabilized and filtered. If the power supply is generated by a single phase rectifier, use a 4700µF/40V capacitor; if pulse voltage is generated by a three-phase rectifier connect a 1000µF/40V capacitor (see fig. 6 "wiring block diagram"). The electrical connections to the reference generators must be made with screened cable with shield connected to ground.

#### 4.2 Reference signal (see [5], [6], [7])

They are the control signals coming from the electronic control unit system and corresponds to the reference values for flow rate and pressure (0 ÷ +10V) on pins 12c and 26c respectively. It's possible to act on reference signals by trimmers (Qmax, Qzero, Pmax, Pzero) to perform according to control requirements. Trimmers Qzero and Pzero allows to adjust the electric zero with the hydraulic zero for flow (displacement) and pressure respectively. Trimmers Qmax and Pmax allows even to set the max flow (displacement) and the max pressure in the hydraulic system.

#### 4.3 Pressure feedback signal (see [5])

This signal comes directly from the transducer applied which measures the system pressure value.  
Two internal settings are available to allow in selecting feedback scale signal in relation with the transducer applied:  
SWD-6 = ON for 0,5 ÷ 5,5V signal ; SWD7 = ON for 0 ÷ +10V signal.

**Attention:** must be set ON just one switch at time.

#### 4.4 Type of controls (see [5], [6])

For pressure values under the relevant reference signals, the flow rate signal goes through the controller without modification, acting a regulation of the displacement of the pump in open loop control.

The E-ME-K-0PQ electronic controller operates the pressure control and flow rate limitation when the difference between the reference and feedback signal is close to zero.

When the control is enabled, the pressure error signal and the derive of the feedback are treated by the two Proportional and Integral gains generating the flow control signal presents at the output of the E-ME-K-0PQ on 12a contact.

That signal is sent to the electronic driver for the proportional control of the displacement of the pump, modulating the system pressure in closed loop control.

The pressure control can be externally disabled supplying the 22c contact (+10 ÷ +34V) or internally through the SW2 switch in OFF position.

The output signal can be inverted with the SW3 internal switch in OFF position.

#### 4.5 Control loop parameters setting (see [5], [6])

The task of the control loop is to process the error signal between reference and feedback and consequently to produce an output signal to cancel the error itself.

At the same time it must be able to adjust the real pressure on the system to the variations of the reference signals without persisting oscillations.

The controller operates through three different actions:

the proportional gain "P" operates on the error value, the derivative gain "D" on the error variations over time and the integral gain "I" on the error quantity accumulated over time.

##### Proportional effect "P"

The value of the gain constant can be set between 16 different values with preselector "P" located on the front panel (see fig. 5 "topographical view of regulations").

##### Integral effect "I"

The integral action time can be set between 16 different values with preselector "I" located on the front panel and the adjustments of the integrative effect are obtained with switches SW1-1... SW1-6 located internally to the card. (see fig. 5 "topographical view of regulations").

This action permits to optimize the static performance of the variable displacement pump reducing deviations from the reference value and damping undesired dynamic oscillations.

##### Derivative effect "D"

The derivative action time can be set between 16 different values with preselector "D" located on the front panel and the adjustments of the derivative effect are obtained with switches SWD-1... SWD-5 located internally to the card.

This action, coupled to the proportional one, permits to optimize the dynamic performance of the variable displacement pump quickly compensating the variations of the reference valves and interference.

Proportional, Integral and Derivative effects available on front panel as well as relative SW settings are factory presetted according to the pump coupled with the electronic card. This setting is identified by a conventional set code at the end of the model code.

**PCNNSA** = PVPC-SL\*-3029; PVPC-SL\*-4046; PVPC-SL\*-5073  
 Switched position for set code **PCNNSA**  
**SWI** = 2, 4, 6 ON  
**SWD** = 1, 2, 5, 7 ON

**4.6 Auxiliary signals** (see [5], [6], [7])

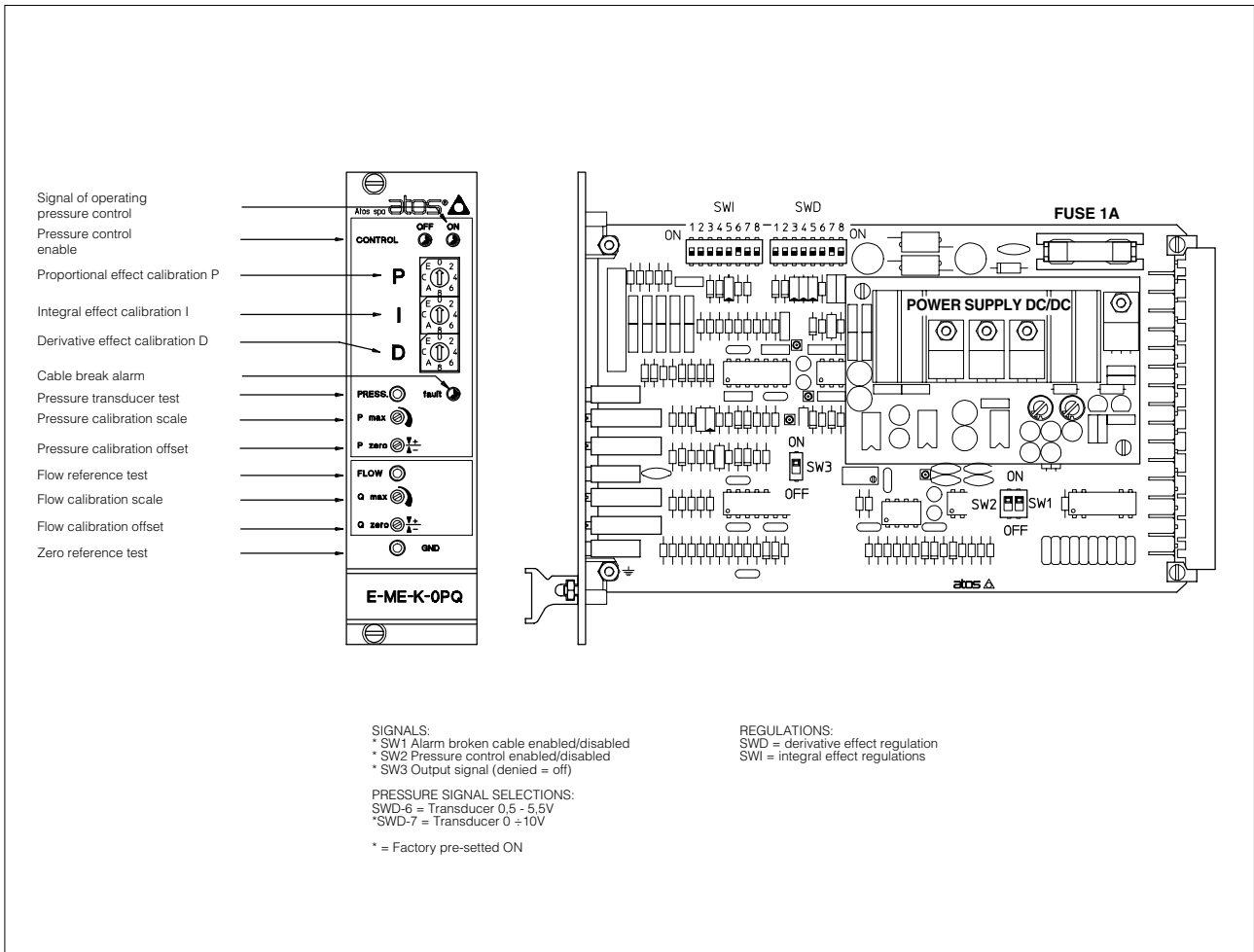
**Enable pressure control:** it is possible to enable or inhibit this control through contact 22c or internally by the switch SW2. In order to enable the card it's necessary that the contact 22c is connected to GND and internal switch SW2 = ON ( factory preset ); to control inhibit supply on contact 22c +24Vdc or switch internally SW2 = OFF ( note: only one of these conditions are required to inhibit the closed loop pressure control).

**Signal of control operating:** it is enabled when control signal is operating. The signal is visualized on the panel-through the green led "CONTROL ON" illuminated and it is also available for monitoring on 28a contact ( 0V ).

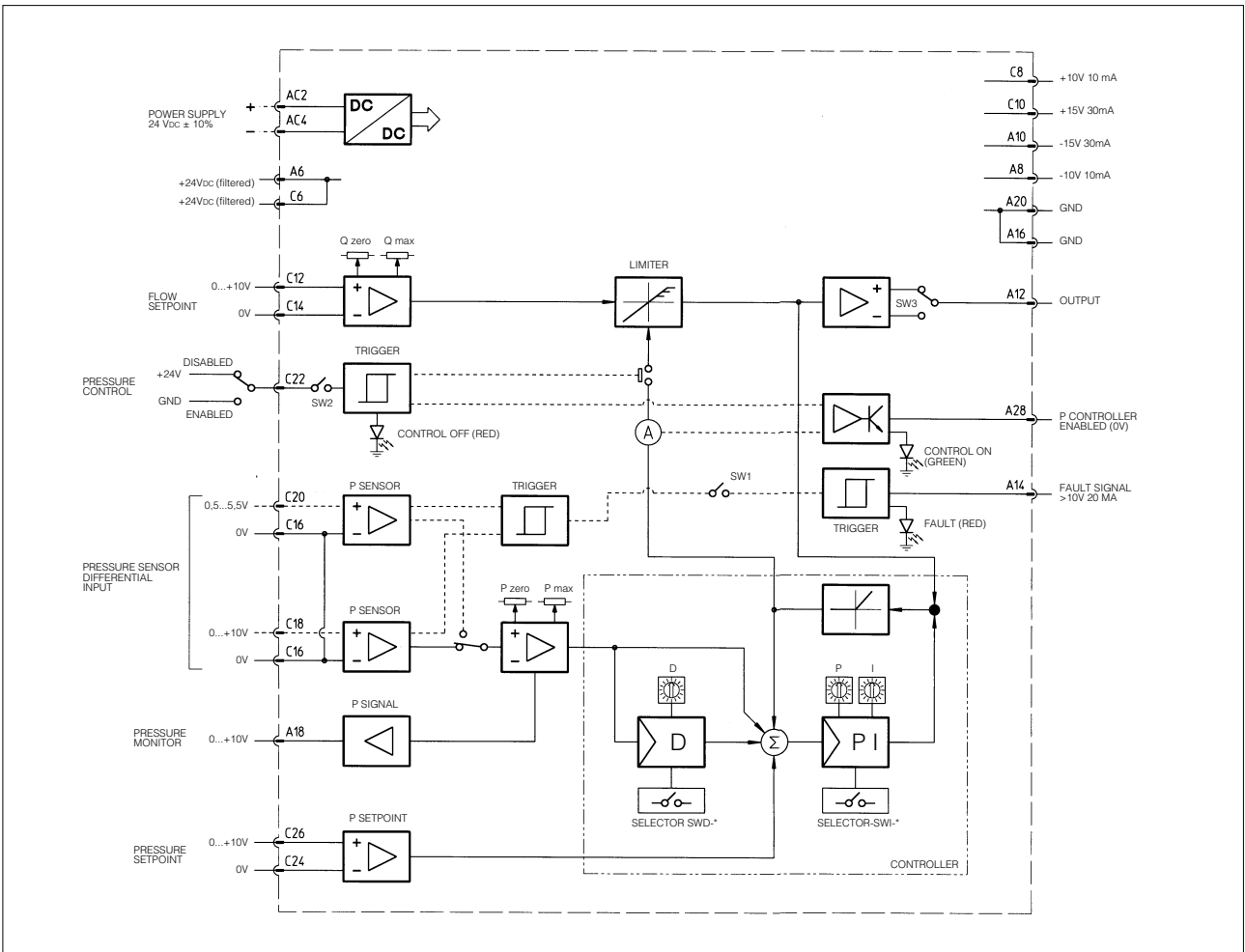
**Alarm:** It indicates the break of the pressure transducer cable.  
 When the pressure transducer cable is interrupted or not connected, the contact at output 14a switches to 0V and the red led "fault" illuminates on the front panel, allowing safety checks and fault diagnosis to be carried out. If the transducer cable is intact and correctly wired, the led "fault" is not illuminated and the contact 14a shows a >10V 20mA signal. This signal can be disable by the internal switch SW1 in OFF position ( factory preset: ON ).

**Monitor:** the real value of pressure transducer is available on 18a contact and on test point "PRESS" ( front panel ), as voltage signal 0 ÷ 10V.

**5 TOPOGRAPHICAL VIEW OF REGULATIONS**



## 6 WIRING BLOCK DIAGRAM



## 7 ELECTRICAL CONNECTIONS

