



Climatix™

Climatix extension modules ECV

POL994E.00/XXX

POL994U.00/XXX

The ECV extension modules are designed for use in connection with a broad range of bipolar stepper motors.

The extension module extends the number of I/Os of Climatix 6xx controllers and provides a driver for a wide range of bipolar stepper motors used in electronic valves. The module must be connected to a POL6XX controller.

The ECV extension module offers the following features:

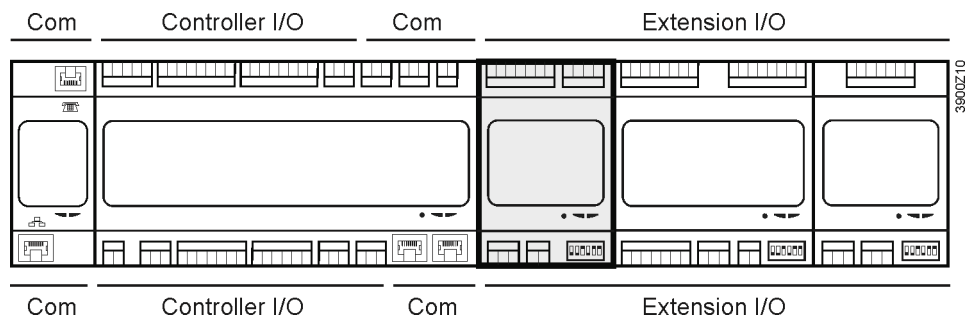
- Power supply AC 24 V or DC 24 V
- 3 universal I/Os
- Power supply for active sensors on board
- 1 relay output
- 1 digital input galvanically isolated AC 115/230 V
- Bipolar stepper motor driver
- Peripheral bus interface
- POL94U.00/MCQ has a UPS for driving the electronic valve to a safe position, if power fails
- The module must be connected to a POL6xx.xxx controller

ECV modules POL94E.00/xxx and POL94U.00/xxx are part of the Climatix product range.

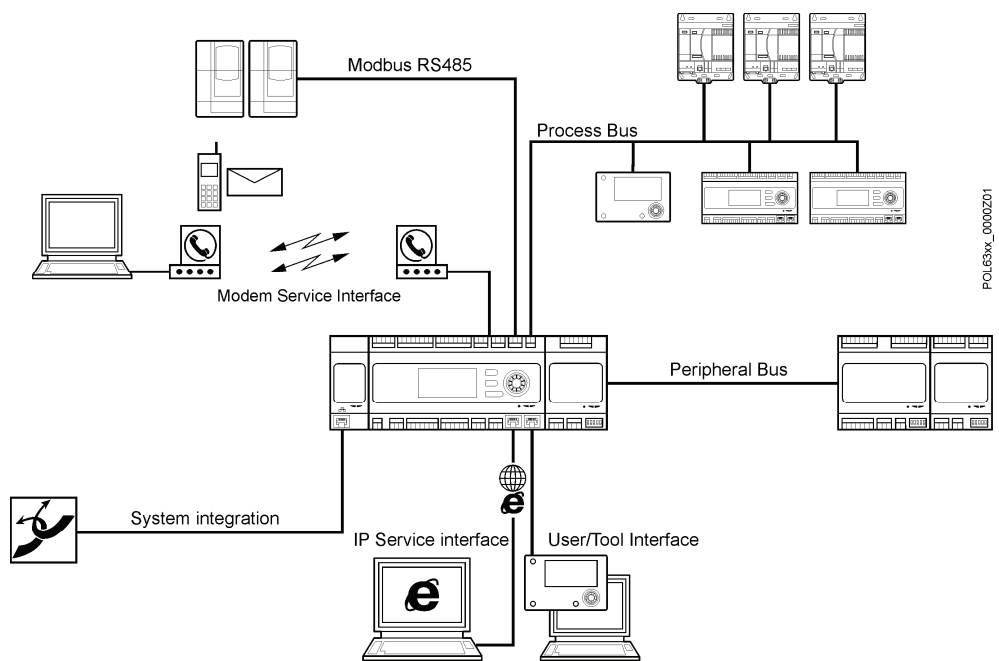
Bipolar stepper motors

Stepping motors come in 2 versions: "Permanent magnet" and "Variable reluctance" (there are also hybrid motors, which – from the controller's point of view – are indistinguishable from permanent magnet motors). Lacking a label on the motor, you can generally tell the 2 apart by feel when no power is applied. Permanent magnet motors tend to "cog" as you twist the rotor with your fingers, while variable reluctance motors almost spin freely (although they may cog slightly because of residual magnetization in the rotor). You can also distinguish between the 2 versions with an ohmmeter. Variable reluctance motors usually have 3 (sometimes 4) windings, with a common return, while permanent magnet motors usually have 2 independent windings, with or without center taps. Center-tapped windings are used in unipolar permanent magnet motors. Stepping motors come in a wide range of angular resolution. The coarsest motors typically turn 90 degrees per step, while high resolution permanent magnet motors are commonly able to handle 1.8 or even 0.72 degrees per step. With an appropriate controller, most permanent magnet and hybrid motors can be run in half-steps, and some controllers can handle smaller fractional steps or microsteps. For both permanent magnet and variable reluctance stepping motors, if just one winding of the motor is energized, the rotor (under no load) will snap to a fixed angle and then hold that angle until the torque exceeds the holding torque of the motor, at which point the rotor will turn, trying to hold at each successive equilibrium point.

Installation concept



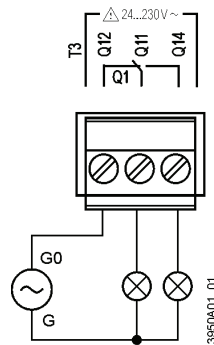
Communication concept



Technical data

General data	Dimensions	W x H x D: 72 x 110 x 75 mm
	Weight excl. packaging	POL94E.00/XXX 152g POL94U.00/XXX 191g
	Base	Plastic, pigeon-blue RAL 5014
	Housing	Plastic, light-grey RAL 7035
Power supply	Operating voltage	AC 24 V \pm 20%; DC 24 V \pm 10%
	Current with AC 24 V	900 mA
	Current with DC 24 V	500 mA
	Frequency	45...65 Hz
	Power consumption	Ca. 18 VA
	Connection interface	Peripheral bus

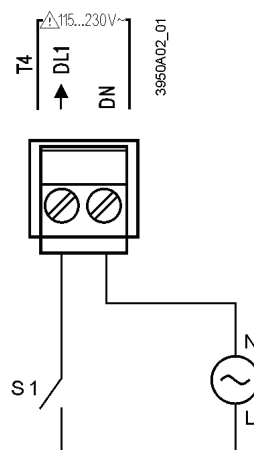
DO1 (T3)	Relay: Type, contact	Monostable, NO/NC contact
	Contact rating	
	Switching voltage	AC 24...230 V (-20%, +10%)
	Rated current (res. / ind.)	Max. AC 3 A / 2 A (cos ϕ 0.6)
	Switching current at AC 19 V	Min. AC 30 mA



Connecting signal lamps to relay outputs

Digital input

DI (T4)	0/1 digital signal (binary)	Galvanically isolated contact
	Rated voltage	AC 115...230 V (-15%, +10%)
	Frequency range	45...65 Hz
	Input current	3 mA at AC 230 V
	Delay	100 ms
	Pulse frequency	Max. 5 Hz



Connecting a AC 230 V signal to a galvanically isolated digital input

Configurable	Via software
Reference potential	Terminals \perp
Contact voltage	Max. DC 24 V (SELV)
Overvoltage protection	Up to 40 V

**Universal I/Os
X1...X3 (T1)**

Analog inputs (X1...X3)

Ni1000

Sensor current	1.4 mA
Resolution	0.1 K
Accuracy within the range -50...150 °C	0.5 K

Pt1000

Sensor current	1.8 mA
Resolution	0.1 K
Accuracy within the range -40...120 °C	0.5 K

NTC 10k

Sensor current	140 µA	
Temperature range	Accuracy	Resolution
-50.....-26 °C	1 K	0.2 K
-25.....+74 °C	0.5 K	0.1 K
+75.....+99 °C	1 K	0.3 K
+100....+124 °C	3 K	1.0 K
+125...+150 °C	6 K	2.5 K

NTC 100k

Sensor current	140 µA	
Temperature range	Accuracy	Resolution
-25.....-11 °C	3 K	0.2 K
-10... ..+9 °C	1 K	0.1 K
+10.....+99 °C	0.5 K	0.1 K
+100...+150 °C	1 K	0.2 K

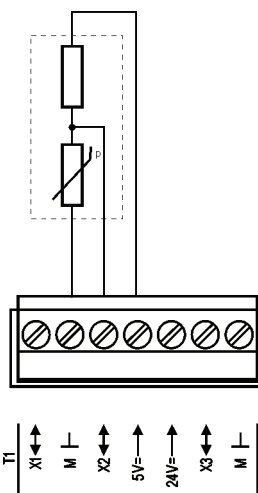
0...2,500 Ω

Sensor current	1.8 mA
Resolution	1 Ω
Accuracy	4 Ω

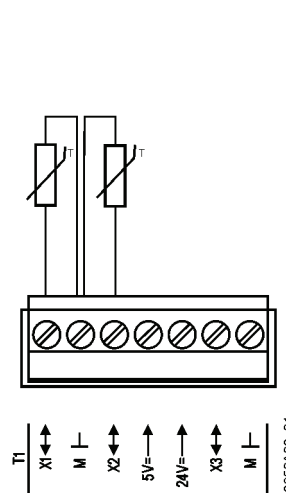
DC 0...5 V input for ratiometric sensors

Resolution	1 mV
Accuracy at 0 V	2 mV
Accuracy at 5 V	25 mV
Input resistance	100 kΩ

Connecting ratiometric sensor to universal I/O



Connecting thermistor to universal I/O



Analog inputs (X1...X3)

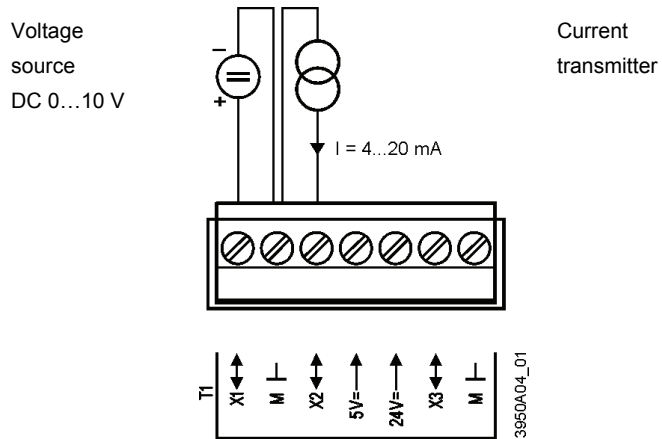
DC 0...10 V input

Resolution	1 mV
Accuracy at 0 V	2 mV
Accuracy at 5 V	25 mV
Accuracy at 10 V	50 mV
Input resistance	100 k Ω

DC 4...20 mA input

Resolution	1 μ A
Accuracy at 4 mA	25 μ A
Accuracy at 12 mA	70 μ A
Accuracy at 20 mA	120 μ A

Voltage input DC 0...10 V and current input 4...20 mA



Digital inputs (X1...X3)

0/1 digital signal (binary)

Sampling voltage / current
Contact resistance

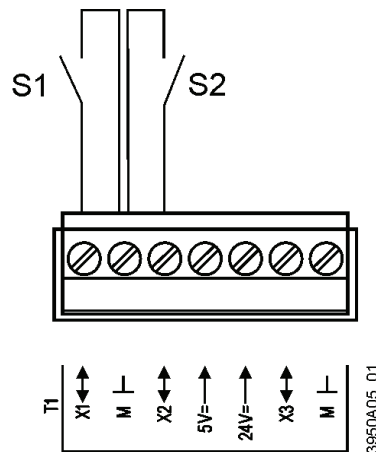
Delay
Pulse frequency

For potential-free contacts

DC 24 V / 8 mA
Max. 200 Ω (closed)
Min. 50 k Ω (open)

10 ms
Max. 20 Hz

Connecting floating contacts to universal I/Os



Analog / digital outputs (X1...X2)

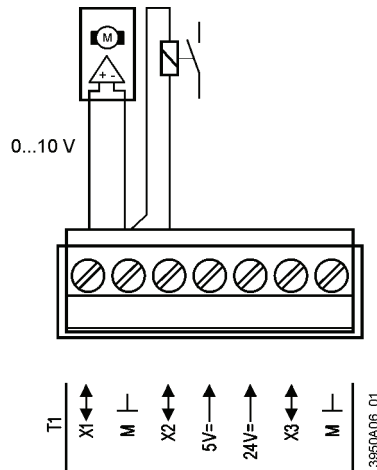
DC 0...10 V output

Resolution	11 mV
Accuracy at 0 V	66 mV
Accuracy at 5 V	95 mV
Accuracy at 10 V	124 mV
Output current	1 mA (short-circuit-proof)

DC output for off board loads

Switching voltage	DC 24 V
Switching capacity	Max. 25 mA

Connecting voltage output and off board relay to universal I/Os



Analog output (X3)

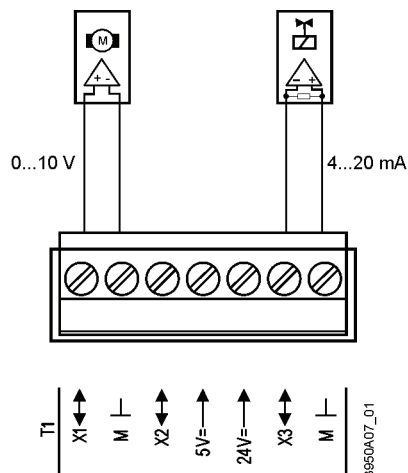
DC 0...10 V output

Resolution	11 mV
Accuracy at 0 V	66 mV
Accuracy at 5 V	95 mV
Accuracy at 10 V	124 mV
Output current	1 mA (short-circuit-proof)

DC 4...20 mA output

Resolution	22 μ A
Accuracy at 4 mA	150 μ A
Accuracy at 12 mA	196 μ A
Accuracy at 20 mA	243 μ A

Connecting voltage output and current output to universal I/Os



Powering sensors active / ratiometric
+5 V, +24 V

2 outputs

Voltage / current

DC 5 V $\pm 2.5\%$ / 20 mA

Voltage / current

DC 24 V $+10\%$, -25% / 40 mA

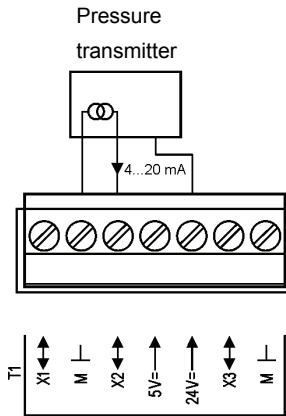
Reference potential

Terminals \perp

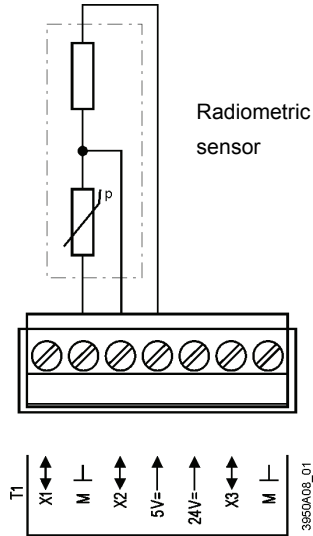
Connection

Short-circuit-proof

Sensor supply



Connecting ratiometric sensor to universal I/O



Motor driver

Driver for bipolar stepper motor

Constant-current mode

Short-circuit-proof

Switching frequency

15 kHz

Half-step mode

8 steps per revolution

Programmable current

0.1...2.8 A

Programmable hold current

0.0...0.5 A

Motor voltage

Max. 42 V

Programmable speed

Max. 500 steps per s

Programmable acceleration

Max. 500 steps per s²

Programmable traverse path

200...60,000 steps

Programmable overdrive

0...5,000 steps

Thermal shutdown

Programmable reference point

Zero or max. point

Diagnostics at startup and in operation

UPS (POL94U.00/MCQ only)

Energy storage

Ultracaps (6 x 10 F at 2.7 V)

Fully charged

200 Ws

Charging time

<2 min

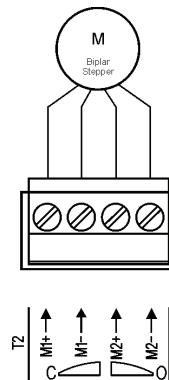
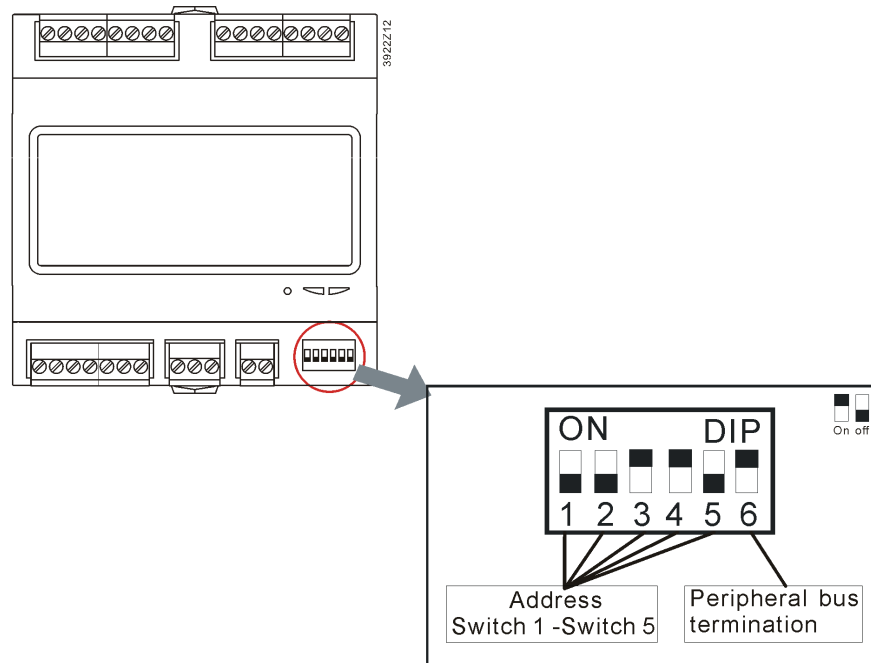


Table of power consumption for different types of valve

Type of valve	Speed (Stp/s)	Current setpoint (mA)	Power (W)	Current of ECV at DC 21.6 V (mA)
ALCO EX8	500	800	12	600
ALCO EX7	330	750	12	600
Danfoss ETS100B	300	500	6.4	300
Sporlan SEHI	200	180	6.8	340

DIP switches

The extension module is equipped with DIP switches for communication with the controller. Switches 1, 2, 3, 4, and 5 are configurable to set the slave address, while switch 6 acts as peripheral bus termination. When the extension module operates as the termination in the network, switch 6 must be set to ON.

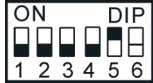
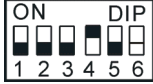


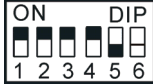
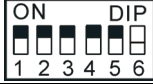


The bit order for the switches is from 5 to 1. The lowest bit is 5 while the highest bit is 1. The following table shows the logic of slave address:

Switch 1	2^4
Switch 2	2^3
Switch 3	2^2
Switch 4	2^1
Switch 5	2^0

By combining switches 1, 2, 3, 4 or 5, a maximum of 31 slave addresses can be configured. The configuration formula is as follows: $2^4+2^3+2^2+2^1+2^0=31$.

Below are some configuration examples:

DIP switch configuration of extension module						
Slave address (controller)	Switch 1	Switch 2	Switch 3	Switch 4	Switch 5	Schematics
1	Off	Off	Off	Off	On	
2	Off	Off	Off	On	Off	
3	Off	Off	Off	On	On	
4	Off	Off	On	Off	Off	
5...29						
30	On	On	On	On	Off	
31	On	On	On	On	On	

Note



The same address of extension module must be set in the application program of the controller. Zero cannot be set as the slave address.

Connection terminals

Possible plugs for I/O signals (not included)


Phoenix FKCVW 2,5 / x-ST
 Phoenix FKCT 2,5 / x-ST
 Phoenix MVSTBW 2,5 / x-ST
 Phoenix FRONT-MSTB 2,5 / x-ST

Solid wire
 Stranded wire (twisted or with ferrule)
 Cable lengths

0.5...2.5 mm²
 0.5...1.5 mm²
 In compliance with load, local regulations and installation documents

Peripheral bus

Board-to-board (not included)	ZEC1,0/4-LPV-3,5 GY35AUC2CI1
Board-to-wire (not included)	ZEC1,0/4-ST-3,5 GY35AUC1R1,4
Solid wire	0.2...1.0 mm ²
Stranded wire (twisted or with ferrule)	0.2...1.0 mm ²
Total cable length	Max. 30 m
Addressing	DIP switches 1...5
Termination	DIP switch 6

Environmental conditions	Operation	IEC 721-3-3
	Temperature	-40...70 °C (POL94E.00/MCQ) -40...60 °C (POL94U.00/MCQ)
	Humidity	<90% r.h. (non-condensing)
	Atmospheric pressure	Min. 700 hPa, corresponding to max. 3,000 m above sea level
Protection	Transport	IEC 721-3-2
	Temperature	-40...70 °C
	Humidity	<95% r.h. (non-condensing)
	Atmospheric pressure	Min. 260 hPa, corresponding to max. 10,000 m above sea level
Standards	Degree of protection	IP20 (EN 60529)
	Safety class	Suitable for use in plants with safety class II
	Product safety	
	Automatic electrical controls	EN 60730-1
	Electromagnetic compatibility	
	Immunity in the industrial sector	EN 61000-6-2
	Emissions in the domestic sector	EN 61000-6-3
	CE conformity	
	EMC directive	2004/108/EC
	Low-voltage directive	2006/95/EC
Ordering data	Listings	UL916, UL873 CSA C22.2M205
	RoHs directive	2002/95/EC (Europe) ACPEIP (China)
	ECV extension module without UPS	POL94E.00/MCQ
ECV extension module with UPS	POL94U.00/MCQ	
Accessories	Plugs (spring cage, cable top entry)	POL094.E6/STD
	1 x Phoenix FKCT 2,5/2-ST GY7035 1 x Phoenix FKCT 2,5/3-ST KMGY 1 x Phoenix FKCT 2,5/4-ST KMGY 1 x Phoenix FKCT 2,5/7-ST GY7035 1 x Phoenix ZEC1,0/4-LPV-3,5 GY35AUC2CI1 2 x Phoenix ZEC1,0/4-ST-3,5 GY35AUC1R1,4	
	Solid wire	0.5...2.5 mm ²
	Stranded wire (twisted or with ferrule)	0.5...1.5 mm ²

Peripheral bus

Board-to-board (not included)	ZEC1,0/4-LPV-3,5 GY35AUC2CI1
Board-to-wire (not included)	ZEC1,0/4-ST-3,5 GY35AUC1R1,4
Solid wire	0.2...1.0 mm ²
Stranded wire (twisted and with ferrule)	0.2...1.0 mm ²
Bus cable	Shielded if length >3 m , twisted pair
Max. number of extension modules	31 (1...31) Do not us 0
Cable lengths	Total max. 30 m



Environmental conditions

Operation	IEC 721-3-3
Temperature POL94E	-40...70 °C
Temperature POL94U	-40...60 °C
Humidity	<90% r.h.
Atmospheric pressure	Min. 700 hPa, corresponding to max. 3,000 m above sea level
Transport	IEC 721-3-2
Temperature	-40...70 °C
Humidity	<95% r.h.
Atmospheric pressure	Min. 260 hPa, corresponding to max. 10,000 m above sea level

Protection standards

Degree of protection	IP20 (EN 60529)
Product safety	
Automatic electrical controls	EN 60730-1
Electromagnetic compatibility	
Immunity in the industrial sector	EN 61000-6-2
Emissions in the domestic sector	EN 61000-6-3
CE conformity	
EMC directive	2004/108/EC
Low-voltage directive	2006/95/EC
Listings	UL916, UL873 CSA C22.2M205
RoHS directive	2002/95/EC (Europe) ACPEIP (China)

Engineering notes



Warning

To ensure protection against accidental contact with relay connections carrying voltages above 42 V_{eff}, the module must be installed in an enclosure (preferably a control panel). It must be impossible to open the enclosure without the aid of a key or tool.
 AC 230 V cables must be double-insulated against safety extra low-voltage (SELV) cables.

Disposal notes



The module contains electrical and electronic components and must not be disposed of together with household waste.

Local and currently valid legislation must be observed!

Dimensions

Dimensions in mm

Layout of
 EVC modules
 POL94E.00/XXX
 POL94U.00/XXX

