CAREL

connectivity, monitoring and remote management systems

electronic expansion valves and drivers


# E²V

## proportional electronic expansion valve

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# The new state-of-the-art of the expansion technology in all kind of refrigerating applications

CAREL electronic expansion valves E²V with proportional modulation and excellent technical and functional characteristics, allow an efficient control of refrigeration and air-conditioning units, and consistent energy saving performances

- efficient control of refrigeration and air-conditioning units thanks to the extended operating range;
- wide range available to cover all applications requiring a high degree of flexibility, cooling capacities up to 40 kW.

The flow of refrigerant is modulated by a nozzle coupled to a torpedo-shaped aperture, measuring more than 15 mm long, over a wide operating range. The internal mechanism is fitted on a calibrated spring with ball bearings and guarantees a stable and reliable regulation reducing the risks of failures.

E²V is completely manufactured using laser-welding techniques on high-quality materials (AISI 316L), as well as technopolymers.
CAREL has paid special attention to the smallest details in designing E2V to ensure very high reliability for operations up to 35 bars of differential pressure and of up to 45 bars of absolute pressure.
Other features include exclusive axial motion of the nozzle aperture and seal gasket in the closing position.
By installing just one expansion valve, the use of non-return valves can be avoided, making the refrigerant circuit much simpler.

CAREL products such as the EVD EVO, MPXPRO and pCO5 feature native support for valve control.

### Equipercentile profile

Guarantees precise control even when operating at part load.

### Perfect seal on closing

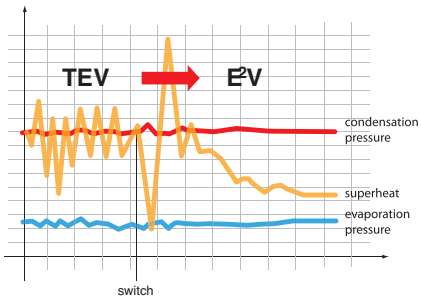
In the closed position the valve provides perfect sealing to refrigerant flow, thanks to the Teflon gasket on the actuator and the calibrated spring that presses this against the edge of the opening.

### High reliability and high quality materials

The valve kinematic mechanism is made entirely from high quality materials. The construction without reduction gears means the mechanism is reliable and long-lasting, guaranteeing extended product life.

## Precision control

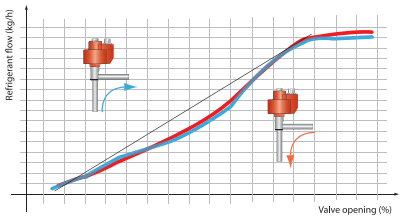
E²V stands out for its quality of control and for its capacity to quickly reach and maintain the operating stability of the unit. The latter aspect makes it ideal for precision air-conditioning, telecommunications (shelters) and industrial refrigeration applications.
In addition to the energy savings, E²V also ensures an increase in performance and stability of the unit.




The E²V range includes a solution compatible with ammonia refrigerant (R717), featuring 10 mm stainless steel fittings. Moreover, a range of valves is also available for high pressure $CO_2$ applications; up to 140 bars max. pressure and 120 bars differential pressure.

## Wide range of operation

The equipercentage variation of the refrigerant flow-rate to the degree of opening of E²V in both directions ensures high precision control in all applications, even at low flow-rates.

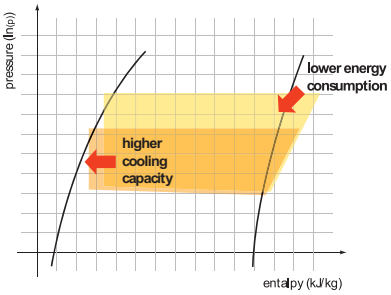



## Energy savings

The wide range of operation at various differential pressures and the precision in terms of control allows significant energy savings.
The use of E²V technology ensures savings that translates into a very fast return on investment.

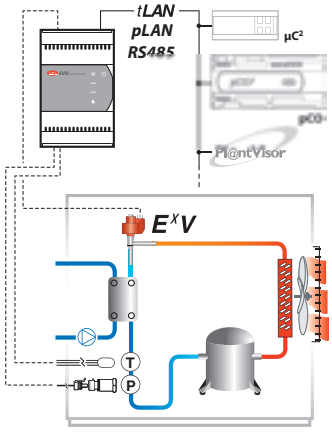
In addition, it has been proven that in commercial refrigeration units and in telecom control room conditioning the reduction in consumption that can be achieved using the E²V together with floating condensing pressure control goes from 15% to 20% annually, with peaks of up to 30%.

Similar results can be achieved in all refrigeration and air-conditioning applications operating year round.




## Bi-directional flow

E2V valves maintain their flow characteristics, and consequently their precision, in both directions of operation, allowing it to replace the operation of two traditional expansion valves in reverse-cycle heat pumps.
In both directions the cooling capacity is identical and the same is true for the linearity of the flow.




## Control systems

CAREL offers a range of solutions for the management of E²V electronic expansion valves. The operation of E²V is based on the control of the refrigerant superheat, along with some additional functions (MOP, LOP): to calculate these values, a pressure probe and a temperature probe need to be installed at the evaporator outlet.

The refrigerant expansion is managed by the CAREL control algorithm, which calculates the ideal position of the moving element in real time, and then uses the driver with built-in stepper motor to move it to the calculated position.

The probe readings, control algorithm and positioning driver can all be managed using integrated devices or separate modules. In the first case, the devices are integrated into the main controller (for example, a MPXPRO with built-in EEV driver). In the second case, separate EVD evolution modules can be managed by a programmable controller (pCO) or by a simple digital input taken from any parametric controller made by CAREL or other manufacturers.
When programmable controllers are used, the 1tool system allows the control algorithm to be customised so as to adapt operation to the specific needs of the installation (pump down, dehumidification upon request). For parametric controllers, on the other hand, the functions provided represent a complete solution for the needs of standard systems.

### Supervision

Preventive maintenance and efficient alarm management can be implemented by monitoring the refrigerant superheat value and consequently the degree of opening of E2V and the values of other parameters, from the supervisory system (local or remote).

## Technical specifications

| | |
|---|---|
| Compatibility | R22, R134a, R404a, R410a, R407c, R507a, R717, R744 |
| Max. operating Pressure (MOP) | up to 45 bars (653 psi);<br>140 bar (2.030 psi) (high pressure version) |
| Max. operating Pressure P (MOPD) | up to 35 bar (508 psi);<br>120 bar (1.740 psi) (high pressure version) |
| P.E.D. | Gr. 2, art. 3, par. 3 |
| Refrigerant temperature | -40T65 °C (-40T149 °F) |
| Room temperature | -30T50 °C (-22T122 °F) |

Contact CAREL INDUSTRIES for different operating conditions or alternative refrigerants

### CAREL E²V Stator - Two pole low voltage stator (2 phases - 24 polar shoes)

| | |
|---|---|
| Phase current | 450 mA |
| Drive frequency | 50 Hz ±10 |
| Phase resistance (25 °C) | 36 Ohm ±10% |
| Index of protection | IP65 with E2VCON****<br>IP67 with E2VCAB*** |
| Step angle | 15° |
| Linear advance/step | 0,03 mm (0,0012 inch) |
| Connessioni | 4 fili (AWG 18/22) |
| Connections | 480 |
| Control steps | 500 |

## E2V - cooling capacity *

### Air-Conditioning

condensation= 38 °C  evaporation= 4.4 °C

| | R22 | R134a | R404a | R410a | R407c | R507a |
|---|---|---|---|---|---|---|
| E2V05 | 1,9 | 1,5 | 1,4 | 2,3 | 2,0 | 1,35 |
| E2V09 | 2,6 | 2,0 | 1,8 | 3,1 | 2,6 | 1,8 |
| E2V11 | 4,5 | 3,5 | 3,3 | 5,4 | 4,7 | 3,2 |
| E2V14 | 6,9 | 5,3 | 5,0 | 8,3 | 7,1 | 4,9 |
| E2V18 | 9,9 | 7,6 | 7,1 | 11,8 | 10,1 | 6,9 |
| E2V24 | 19,6 | 15,1 | 14,1 | 23,6 | 20,2 | 13,8 |
| E2V35 | 39,5 | 30,3 | 28,4 | 47,5 | 40,6 | 27,7 |

Subcooling 1 °C

### NT Refrigeration

Condensation= 40 °C  Evaporation= -15 °C

| | R22 | R134a | R404a | R410a | R407c | R507a |
|---|---|---|---|---|---|---|
| E2V05 | 2,3 | 1,7 | 1,6 | 2,7 | 2,3 | 1,5 |
| E2V09 | 2,9 | 2,2 | 2,1 | 3,6 | 3,0 | 2,0 |
| E2V11 | 5,2 | 3,9 | 3,7 | 6,4 | 5,3 | 3,6 |
| E2V14 | 8,0 | 6,0 | 5,7 | 9,8 | 8,0 | 5,5 |
| E2V18 | 11,4 | 8,5 | 8,0 | 13,9 | 11,5 | 7,8 |
| E2V24 | 22,6 | 16,9 | 16,0 | 27,6 | 22,9 | 15,6 |
| E2V35 | 45,5 | 34,0 | 32,2 | 55,6 | 46,2 | 31,5 |

Subcooling 5 °C

### LT Refrigeration

Condensation= 40 °C  Evaporation= -40 °C

| | R22 | R134a | R404a | R410a | R407c | R507a |
|---|---|---|---|---|---|---|
| E2V05 | 2,3 | 1,65 | 1,48 | 2,7 | 2,2 | 1,4 |
| E2V09 | 3,0 | 2,1 | 2,0 | 3,6 | 2,9 | 1,9 |
| E2V11 | 5,3 | 3,8 | 3,5 | 6,4 | 5,2 | 3,4 |
| E2V14 | 8,1 | 5,8 | 5,4 | 9,9 | 8,0 | 5,2 |
| E2V18 | 11,5 | 8,2 | 7,6 | 14,0 | 11,3 | 7,4 |
| E2V24 | 23,0 | 16,3 | 15,2 | 27,9 | 22,6 | 14,8 |
| E2V35 | 46,3 | 32,9 | 30,5 | 56,2 | 45,5 | 29,8 |

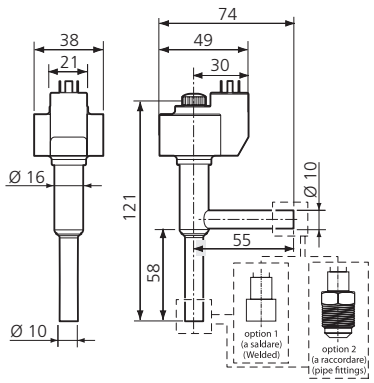
* Condensing Unit pressure drop 0.5 bar, Evaporating unit pressure drop 0.5 bar.

## Codes

| Valves | |
|---|---|
| E2V**CS000 | valve for high pressure applications; sizes 05 to 18 |
| E2V**BS000 | valve for compatibility with R717 refrigerant (ammonia); sizes 05 to 35 |
| E2V**BSF00 | copper connections 12 mm - 12 mm ODF |
| E2V**BSM00 | copper connections 16 mm - 16 mm ODF |
| E2V**BRB00 | threaded brass fittings, 3/8"-1/2" SAE |
| **Option/spare part codes** | |
| E2VCON0000 | pack of 5 IP65 cable connectors |
| E2VCAB0600 | co-moulded cable-connector, 3.0 m IP67 |
| E2VCAB0300 | co-moulded cable-connector, 6.0 m IP67 |
| E2VSTA0200 | spare stator for E2V*B* |

The valve packages do not include the connector

## Dimensions

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