

CAREL



New
TWIN EEV driver
1 driver for 2
expansion valves

EMERSON
digital scroll
APPROVED

E^XV Sistema,
Precision mechanics,
powerful control

E^xV Sistema: A complete range of electronic valves for HVAC/R applications



With E^xV Sistema CAREL offers a complete and integrated solution for controlling evaporation temperature in air-conditioning and refrigeration units, through the E^xV electronic expansion valves and the new EVD evolution superheat controller. This solution is the result of decades of experience in the specific application, and thanks to the new EVD evolution driver, it integrates perfectly

into the series of CAREL controllers for the optimised management of the complete refrigeration cycle. Today CAREL offers a complete range of electronic valves for cooling capacities up to 1750 kW, covering the needs of all HVAC/R applications.





CAREL E^V valves have been lifetime tested in the **most critical** operating conditions by the CAREL labs

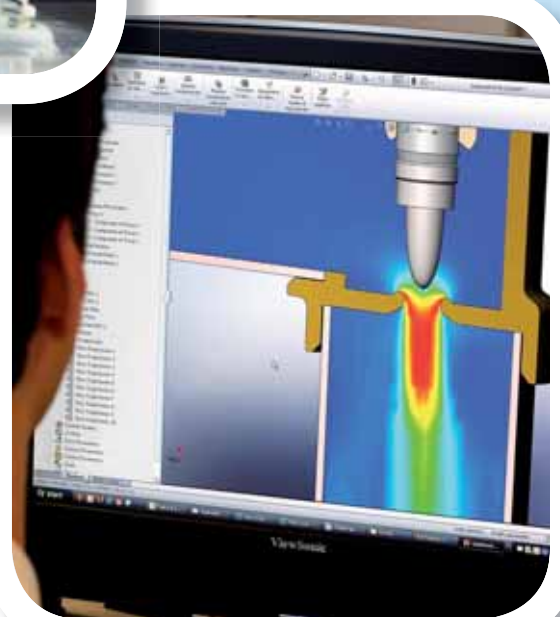


CAREL **accepts no compromises** in the quality of its products: at the end of the production process, each valve undergoes functional tests and is checked for refrigerant leaks



The E^V range was designed in-house at the CAREL labs and is **manufactured and assembled** at the Group's facilities using the most advanced technology

The CAREL labs conduct on-going research into **innovative solutions** for optimising the performance of the E^V, valves, using computerised simulation techniques



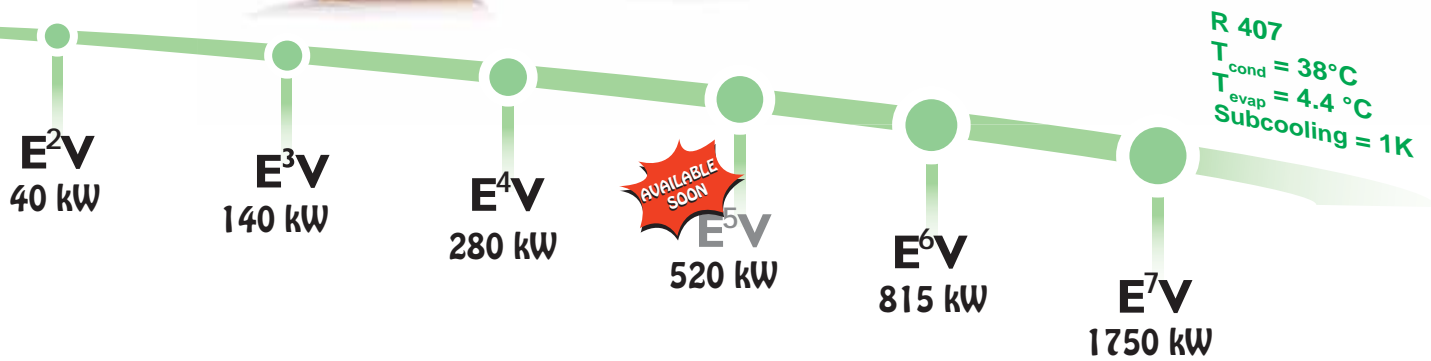
1.750 kW *maximum cooling capacity**

10 yrs *experience in the development of control systems and superheat control valves*

100% *of valves tested after production*

* Model E^V with R407C refrigerant, at conditions $T_{cond} = 38^{\circ}C$, $T_{evap} = 4.4^{\circ}C$, subcooling = 1K.

E^XV series valves & EVD evolution driver



The range of electronic expansion valves offered by CAREL covers cooling capacities up to 1750 kW, thanks to the new E⁷V series.

The main features of the E^XV valves are:

- External stator replaceable without dismantling the valve
- Removable motor mechanism (except for model E²V) to assist soldering and replacement without unsoldering the valve

- Integrated flow indicator (except for models E²V & E³V)
- Gearless
- Movement on stainless steel ball bearings
- Tight when valve closed
- Control with flow in both directions
- Equipercentile variation of refrigerant flow-rate: ensures high precision control at low flow-rates



Energy saving

Operation at minimum possible condensing pressure means less work performed by the compressor, and a consequent reduction in energy consumption



Easy to use

Quick start with just 4 settings, graphic display with help on the parameters, easy driver and valve installation and maintenance



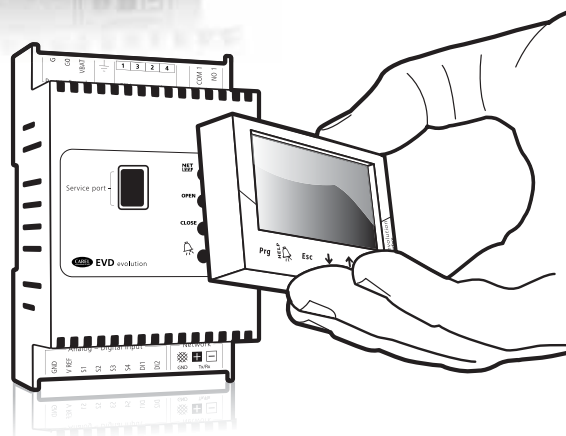
CO₂ ready

CAREL control systems and E^XV valves can manage both subcritical and transcritical CO₂ cycles



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The new EVD evolution driver has been enhanced with advanced functions and a new user interface that makes it even easier to use and configure:

- superheat control with auxiliary high pressure, low pressure and low superheat protection
- start-up with just 4 parameters: refrigerant used, model of valve, type of pressure sensor and application (chiller, showcase, etc.)
- new battery module
- Twin version to control two valves
- self-adaptive algorithm
- algorithm for Digital Scroll applications
- connection diagram visible on the display
- removable multi-language graphic display, with "help" on the parameters
- multiple units of measure (metric or Imperial)
- user management with passwords for accessing different levels of configuration
- copy parameter values to other EVDs using the display
- LEDs for monitoring the main parameters
- use of ratiometric or 4-20 mA transducers (the latter

can be shared between multiple drivers)

- second digital input for defrost management
- possibility to use backup sensors
- serial communication protocols: CAREL-master, pLAN, ModBus®.

The new TWIN version can independently control two electronic expansion valves, and represents the ideal solution for two circuit units or different control functions (i.e. superheat and hot gas bypass). Connected to a pCO series controller, EVD Evolution can manage superheat on units fitted with Digital Scroll compressors, using a specific algorithm patented by CAREL and approved by Emerson Climate Tech.



Performance

Sophisticated control functions (LOP, MOP, Low SH, transcritical CO₂,...) and construction with advanced materials for optimum management of refrigerant flow, even in the most critical conditions



Multilingual

System easy to understand and configure, with 10 languages available, in addition to English (always available)



Reduced environmental impact

Compatibility with natural refrigerants (CO₂) and energy saving help reduce ozone layer depletion and greenhouse gas emissions

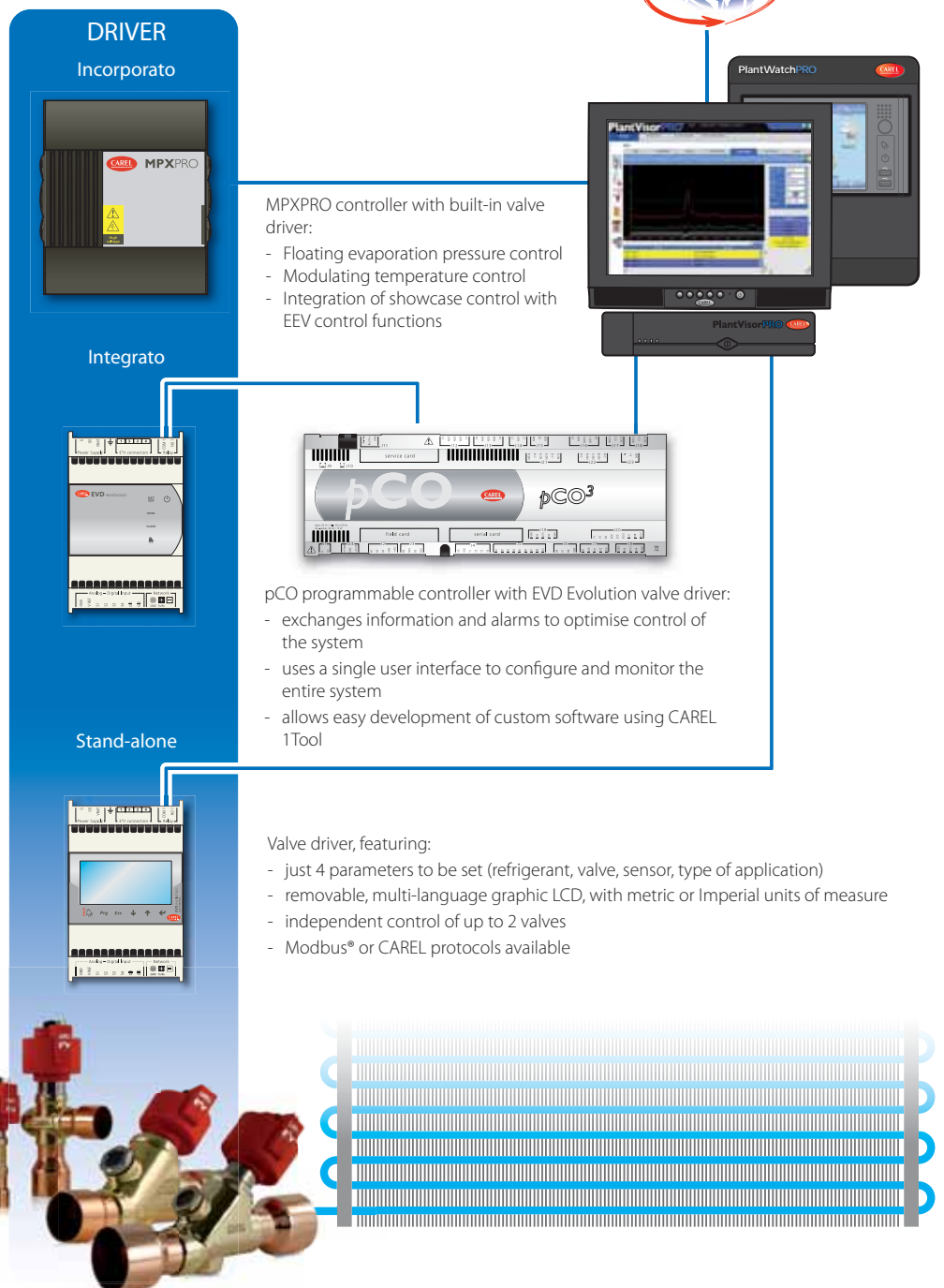
CAREL integrated systems

APPLICATIONS

Retail: the new MPXPRO family controllers for showcases can be fitted with a built-in driver for controlling CAREL E^V valves. In supermarket applications, all the MPXPRO controllers interface to CAREL supervisory systems so as to guarantee complete control of the installation.

Air-conditioning: the complete range of CAREL E^V valves is suitable for all refrigeration units up to 1750 kW; in addition, integration between EVD evolution and the pCO series programmable controllers ensures optimised control of the entire refrigeration system and sharing of data with CAREL supervisory systems.

Stand-alone: the EVD driver evolution can independently control the CAREL E^V valves (stand-alone mode), using just one digital input for activation. This solution is suitable for any refrigerant circuit, regardless of the controller used.

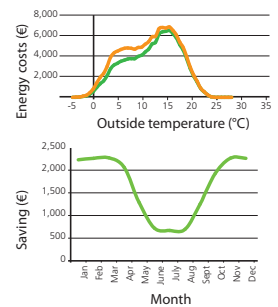
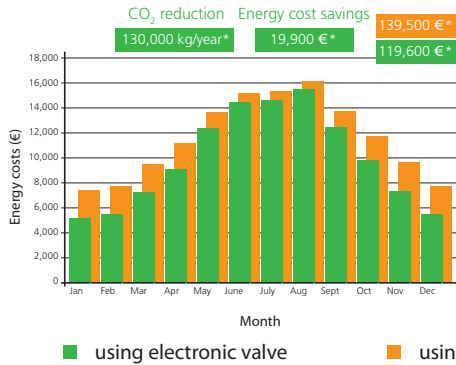


Energy saving: our future



-14.3%
energy consumption

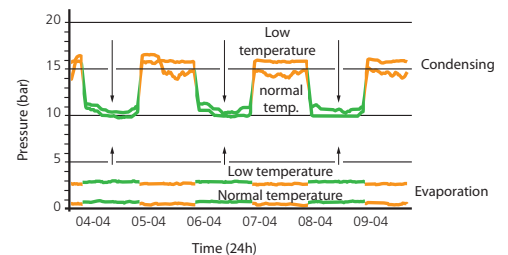
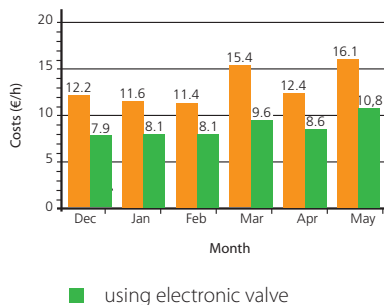
One of the main advantages in using E^X technology is the energy saving achievable due to improved efficiency of the refrigeration cycle. The possibility to operate at low condensing pressures, as well as precise superheat control, allow considerable energy saving: the advantages have been proven and validated in the field, in both refrigeration and air-conditioning applications, and guarantee extremely short payback times compared to standard mechanical technology.



*Measurements carried out in a telephone exchange air-conditioning system, operating with six two-circuit chillers on R22, maximum capacity 900 kW

The field trials were performed installing a CAREL E^XV valve and a traditional thermostatic valve in parallel, and then activating these alternately and monitoring energy consumption and cooling efficiency during operation with each valve. This has provided concretely proof of the savings achievable using CAREL E^XV technology

-30%
energy consumption **



**Measurements carried out in a medium-sized supermarket on showcases and compressor racks operating on R404A. The data incorporate the optimisation of the compressor rack with floating condensing and evaporation pressure, the use of E^XV valves and the control of anti-sweat heaters with temperature and humidity monitoring. Part of the data (floating condensing pressure control with E^XV valves) are also the result of CAREL analysis and case studies supported by the CNR (National Research Centre) and presented during the IIR conference "Energetic performance of different expansion valves in a supermarket" (Vicenza, 2005).

E^XV sizing example

Below is an example of sizing the E^XV valves according to the specified typical conditions in air-conditioning and centralised refrigeration applications. For further information, see the instruction sheet available at www.carel.com (code +050001225).

The values in the tables correspond to around 80% of the maximum effective cooling capacity. The total refrigerant pressure drop in the high and low pressure branches has been assumed to be no higher than 2 to 3 bars.

Application: Air-conditioning

Operating conditions

Saturated condensing temperature: 38 °C

Saturated evaporation temperature: 4.4 °C

Subcooling: 1 K

Rated cooling capacity (kW)

valve model	R22	R134A	R407C	R410A
E2V05B	1,5	1,15	1,55	1,8
E2V09B	2,6	2,0	2,7	3,1
E2V11B	4,5	3,4	4,6	5,4
E2V14B	6,8	5,3	7,0	8,3
E2V18B	9,9	7,6	10,2	11,9
E2V24B	18,6	14,9	20,0	23,4
E2V30B	31,2	24,0	32,0	37,5
E2V35B	39,0	30,5	40,9	47,8
E3V45A	69,0	53,0	71,0	83,0
E3V55A	100,0	76,0	102,0	120,0
E3V65A	140,0	107,0	143,0	167,0
E4V85A	195,0	149,0	200,0	234,0
E4V95A	270,0	208,0	280,0	-
E6VB2A	800,0	610,0	815,0	958,0
E7VC1A	1700,0	1280,0	1750,0	2050,0

Application: Centralised refrigeration

Operating conditions

Saturated condensing temperature: 38 °C

Saturated evaporation temperature: -30 °C

Subcooling: 1 K

Rated cooling capacity (kW)

valve model	R404A	R507a
E2V05B	1,1	1,1
E2V09B	1,9	1,8
E2V11B	3,4	3,3
E2V14B	5,1	5,0
E2V18B	7,4	7,2
E2V24B	14,5	14,2
E2V30B	23,4	22,7
E2V35B	29,0	28,8

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