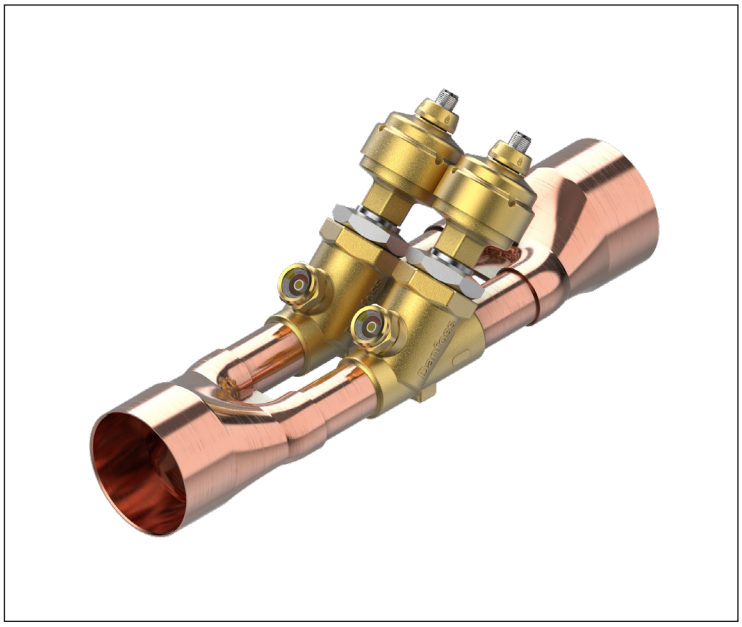
ENGINEERING TOMORROW

Data sheet

# Electric expansion valve

## Type ETS 500P, ETS 800P



ETS 500P, ETS 800P are extension to current electric expansion valves ETS program by integrate dual ETS 250 or dual ETS 400 in parallel. They can be used for precise liquid injection in evaporators for air conditioning and refrigeration applications with high capacity.

The valve piston and linear positioning design is fully balanced, providing bi-flow feature as well as solenoid tight shut-off function in both flow directions.

The valve design uses bi-polar drive providing very precise flow regulation.

ETS 500P and ETS 800P are compatible with electronic control solutions from Danfoss and other manufacturers.

**Features**

- Refrigerants: R134a, R513A, R1234ze, other refrigerants are on request.
- Rated capacity for R134a:
  ETS 500P: 471 TR / 1652 kW
  ETS 800P: 640 TR / 2245 kW
- Maximum working pressure: 25 bar / 363 psig.
- Compatible with oil free applications.
- Precise positioning for optimal control of liquid injection.
- Balanced design.
- Built-in sight glass with moisture indicator.
- Can be operated with flow in both directions and are solenoid tight.
- Low power consumption.
- Danfoss controller type EKE 1 series can be used to drive ETS 500P and ETS 800P.
- For manual operation and service of ETS valves an AST-G service driver is available.

## Approvals

CE RoHS

## Technical data

| | |
|---|---|
| **Compatible refrigerants** | R134a, R513A, R1234ze.<br>For other refrigerants, please contact your local Danfoss representative. |
| **Refrigerant oil** | All mineral oils and ester oils and also support oil free applications. |
| **Comply with P.E.D.** | Yes |
| **Max. opening pressure differential (MOPD) normal flow** | 25 bar (363 psig) |
| **Max. opening pressure differential (MOPD) reverse flow** | 10 bar (145 psig) |
| **Max. working pressure (PS/MWP)** | 25 bar (363 psig) |
| **Inlet fluid temperature** | -40 °C – 65 °C (-40 °F – 149 °F). For higher temperature valve, please contact Danfoss. |
| **Ambient temperature** | -40 °C – 60 °C (-40 °F – 140 °F) |
| **Material of Construction** | Body and AST enclosure in brass, connections in copper. |

## Electrical data

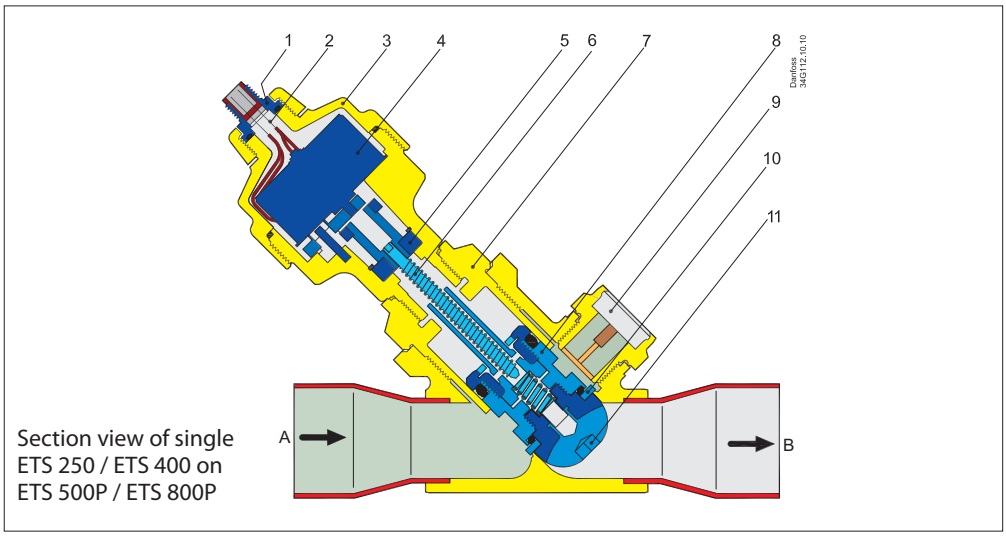
| | |
|---|---|
| **Motor enclosure** | IP67 |
| **Stepper motor type** | Bi-polar - permanent magnet |
| **Step mode** | 2 phase full step |
| **Phase resistance** | 52 Ω ±10% |
| **Phase inductance** | 85 mH |
| **Step angle** | 7.5° (motor)<br>0.9° (lead screw)<br>Gearing ration 8.5:1. $(38/13)^2$:1 |
| **Nominal voltage** | Constant voltage drive: 12 V dc -4% – 15% |
| **Phase current** | Using chopper drive: 100 mA RMS -4% – 15% |
| **Holding current** | Constant voltage drive: Depends on application<br>Chopper drive: full current allowed (100% duty cycle) |
| **Max. total power** | Voltage / current drive: 5.5 / 1.3 W (UL: NEC class 2) |
| **Step rate** | Constant voltage drive: 150 steps/sec<br>Chopper current drive: 0 – 300 steps/sec. 300 recommended |
| **Total steps** | For each ETS 250 or ETS 400: 3810 [160 / -0] steps |
| **Full travel time** | For each ETS 250 or ETS 400: 25.4 / 12.7 sec. (voltage / current) |
| **Lifting height** | For each ETS 250 or ETS 400: 17.2 mm (0.7 in.) |
| **Reference position** | Overdriving against the full close position |
| **Electrical connection** | M12 connector |

| | |
|---|---|
| **Compatible Danfoss controllers** | Danfoss EKE 1 series |

## Design

**⚠ Note:**
Flow direction from A to B refers to the normal flow

1. M12 connector
2. Glass seal
3. AST motor housing
4. Stepper motor
5. Bearing
6. Spindle
7. Top Nut
8. Valve piston
9. Sight glass with indicator
10. Valve seat
11. Valve cone



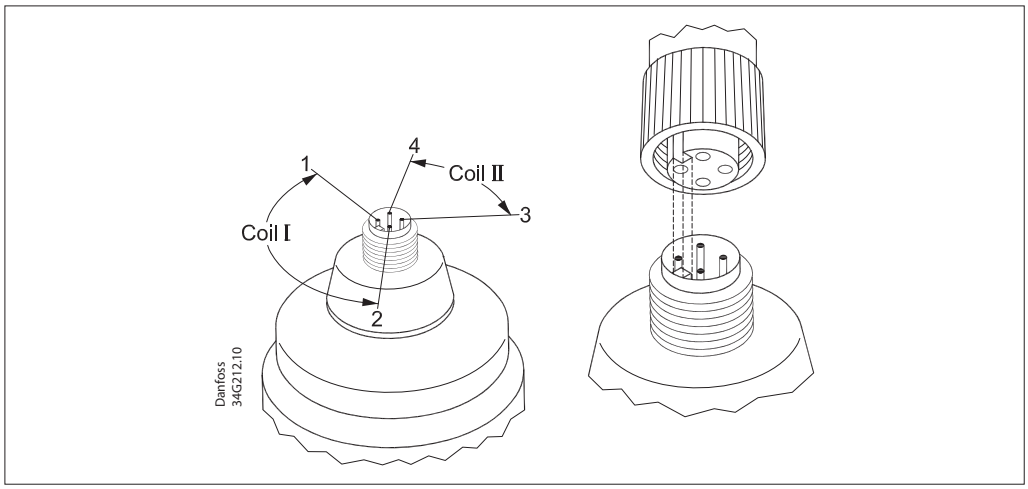

Section view of single ETS 250 / ETS 400 on ETS 500P / ETS 800P

## Sight glass and indicator

ETS 500P and ETS 800P are equipped with sight glass with moisture indicator. The physical position of the piston in the valve can be checked through the sight glass.

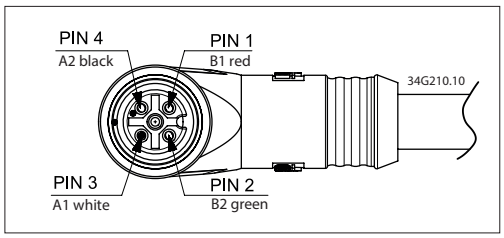
Insufficient sub cooling can produce flash gas which is visible through the sight glass. The moisture indicator in the sight glass indicates dry or wet state of the refrigerant by changing its colour.

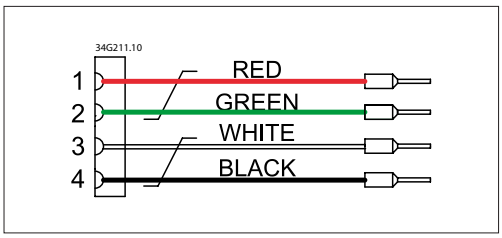
## Electrical wiring

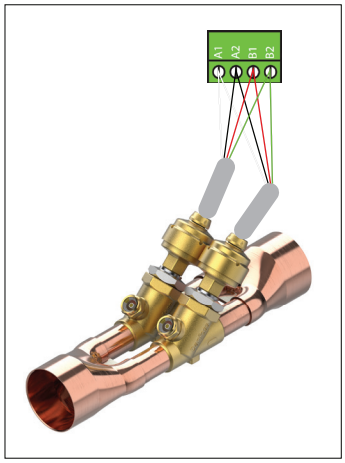



**⚠ Note:**
Electrical check of stepper motor and wiring: Coil I = 52 ohm, coil II = 52 ohm

## Connections






The dual ETS 250 on ETS 500P and dual ETS 400 on ETS 800P are supposed to open/close simultaneously, thus they should be connected to one common EKE 1 series controller.

To make one controller drives dual ETS 250 / ETS 400, follow next additional steps to set the controller correctly prior to commissioning :

1. Go to "Valve selection" in "Valve configuration".
2. Select "ETS 250" (for ETS 500P) or "ETS 400" (for ETS 800P)
3. Change valve type to "User defined valve".
4. Change valve drive current to 282 mA. (Single ETS 250 / ETS 400 requires 141 mA peak current. ETS 500P / ETS 800P requires 2 times of the current as of the single valve. )
5. Done.

## Stepper motor switch sequence

| ↑ CLOSING ↑ | STEP | Coil I | | Coil II | | ↓ OPENING ↓ |
|---|---|---|---|---|---|---|
| | | Red | Green | White | Black | |
| | 1 | + | - | + | - | |
| | 2 | + | - | - | + | |
| | 3 | - | + | - | + | |
| | 4 | - | + | + | - | |
| | 1 | + | - | + | - | |

If the controller driving the ETS valve is from another manufacturer than Danfoss or a custom design, the following points must be considered in order to overcome potential step loss.

a. To ensure total closing of the valve, the controller should have a function to overdrive the valve in the closing direction. It is recommended to overdrive ten percent of the full step range at appropriate intervals.

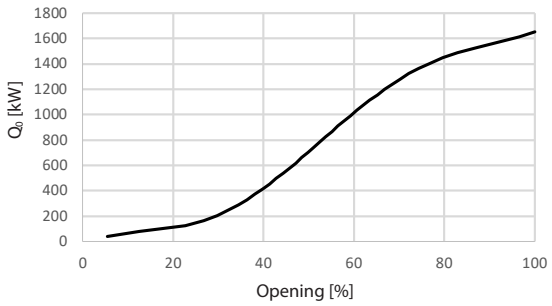
b. The amount of lost steps may increase as a function of the amount of changes of the opening degree. Such designed controller should be able to compensate the lost steps after a defined number of changes in opening degree.

**Warning:**
At power failure the ETS valve will remain in the opening position it has at the moment of power failure, unless a safety device in the form of a battery backup is installed.

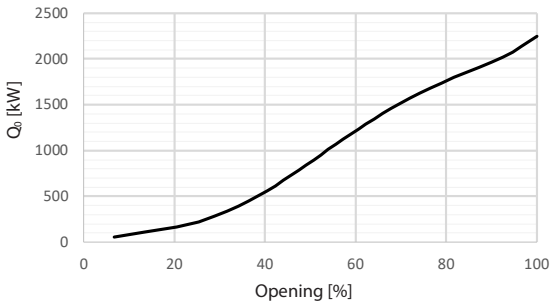
## Capacity

Normal flow direction

**ETS 500P**




**ETS 800P**

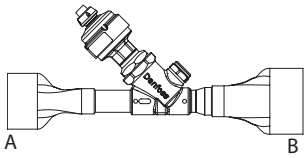



Capacity based on: R134a
$T_e$ = 5 °C / 41 °F
$T_c$ = 32 °C / 89.6 °F
$T_l$ = 28 °C / 82.4 °F

## Coolselector2®

For easy and precise selection of valve, use Danfoss' CoolSelector2® software. You can find the ETS valves on the group, *"Electronic expansion valves"*.
You can download it from http://coolselector.danfoss.com

## Ordering
## ETS 500P / ETS 800P




| Type | Rated capacity[1] | | | | | | Connection | |
|---|---|---|---|---|---|---|---|---|
| | R134a | | R513A | | R1234ze | | ODF × ODF (A × B) | Code no. |
| | [kW] | [TR] | [kW] | [TR] | [kW] | [TR] | [in.] | Single pack |
| ETS 500P | 1652 | 471 | 1518 | 433 | 1289 | 367 | 2 5/8 × 3 1/8 | 034Z1017 |
| ETS 800P | 2245 | 640 | 2060 | 587 | 1760 | 501 | 3 1/8 × 3 1/8 | 034Z1018 |
| ETS 800P | 2245 | 640 | 2060 | 587 | 1760 | 501 | 2 5/8 × 2 5/8 | 034Z1019 |

[1]) The rated capacity is based on:
Evaporating temperature $t_e$ : 5 °C / 40 °F
Liquid temperature $t_l$ : 28 °C / 82 °F
Condensing temperature $t_c$ : 32 °C / 90 °F
Full stroke opening in normal flow direction

## Ordering
## EKE 1 series controllers

| Type | Pack format | Code no. |
|---|---|---|
| Electronic controller EKE 1A | Single pack | 080G5300 |
| Electronic controller EKE 1B | Single pack | 080G5350 |
| Electronic controller EKE 1C | Single pack | 080G5400 |

**Note:**
The controller will be supplied seperately.

## M12 angle cable

**Note:**
The cable will be supplied seperately.

M12 angle female connector is intended for use with a standard M12 male connector, available on stepper motor valves.
This cable is designed to offer high flexibility and small outer diameters with tensile strength. The angle way M12 cable consist of paired, twisted wires, which decreases mutual influence between signals transmitted along the cable and reduces influence of external sources of interference.
The cables thus provides a higher degree of protection against lost steps compared to other cables.

## Approvals

CE RoHS cULus 089 EAC

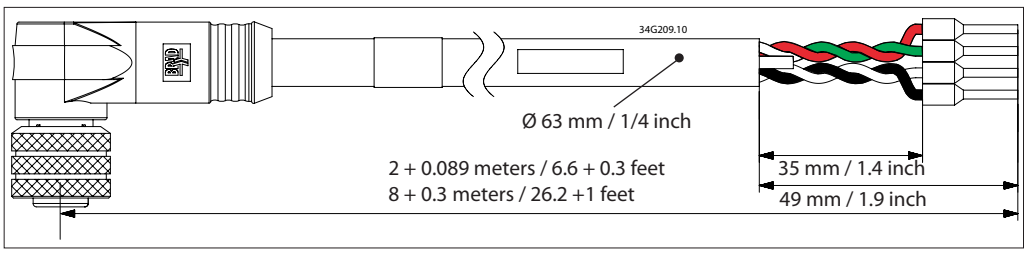
## Specification

| | |
|---|---|
| Jacket | PVC - black |
| Cable outer sheath | Oil - resistant |
| Water proof rating | IP 67 |
| Operating temperature range | -40 – +80 °C |
| Wire type | Twisted pair, cross section 20 AWG / 0.5 mm2 |
| Cable outer diameter | 7.0 mm |
| Minimum bending radius | 10 x cable diameter |
| Cable combustibility / test | Flame retardant / VW-1 / CSA FT - 1 |
| M12 standard | EN 61076-2-101 |
| Reference standard | UL style 2464 and DIN VDE 0812 |
| LVD directive | 2014/35/EU |

## Ordering

| Cable | Cable length (L) | Insulation | Packing format | Code no. |
|---|---|---|---|---|
| PVC - black | 2 + 0.089 m / 6.6 + 0.3 ft | SR-PVC | Single pack | 034G7073 |
| | 8 + 0.3 m / 26.2 +1 ft | SR-PVC | Single pack | 034G7074 |

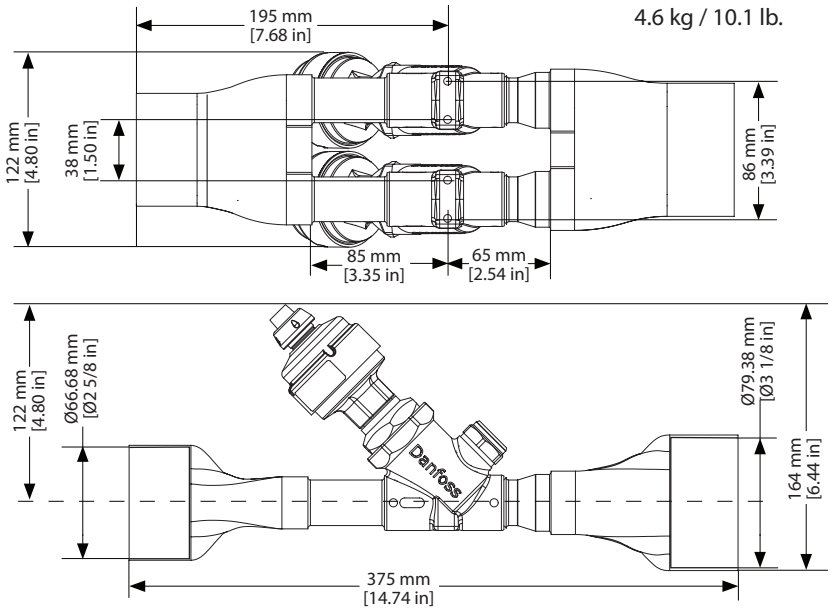
## Dimensions



## Dimensions and weights

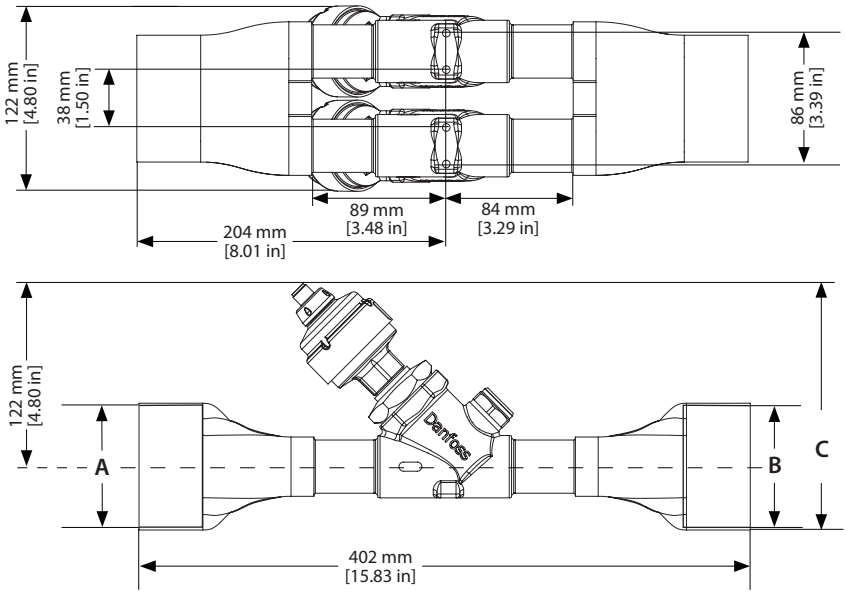
### ETS 500P

4.6 kg / 10.1 lb.




### ETS 800P

5.4 kg / 11.9 lb.




| Code no. | A | B | C |
|---|---|---|---|
| 034Z1018 | Ø79.38 mm/ Ø 3 1/8 in. | Ø79.38 mm/ Ø 3 1/8 in. | 164 mm/ 6.46 in. |
| 034Z1019 | Ø66.68 mm/ Ø 2 5/8 in. | Ø66.68 mm/ Ø 2 5/8 in. | 158 mm/ 6.21 in. |

## Related products

| EKE 1 series | EKS 221, ACCPBT, AKS 11/AKS 12 | AKS 32R, AKS 33, NSK | AST-G |
|---|---|---|---|
|  |  |  |  Code no. 034G0013 |
| Superheat controller | Temperature sensor | Pressure transmitter | Service driver |

All Danfoss products fulfill the requirements in REACH.
One of the obligations in REACH is to inform customers about presence of Candidate list substances if any, we hereby inform you about one substance on the candidate list:
A moist indicator in the sight glass contains a paper which is impregnated with Cobalt Dichloride (CAS no: 7646-79-9) in a concentration above 0.1% w/w.
- Avoid skin contact with the paper - Do not inhale the dust from the paper - The paper must be disposed as hazardous waste.