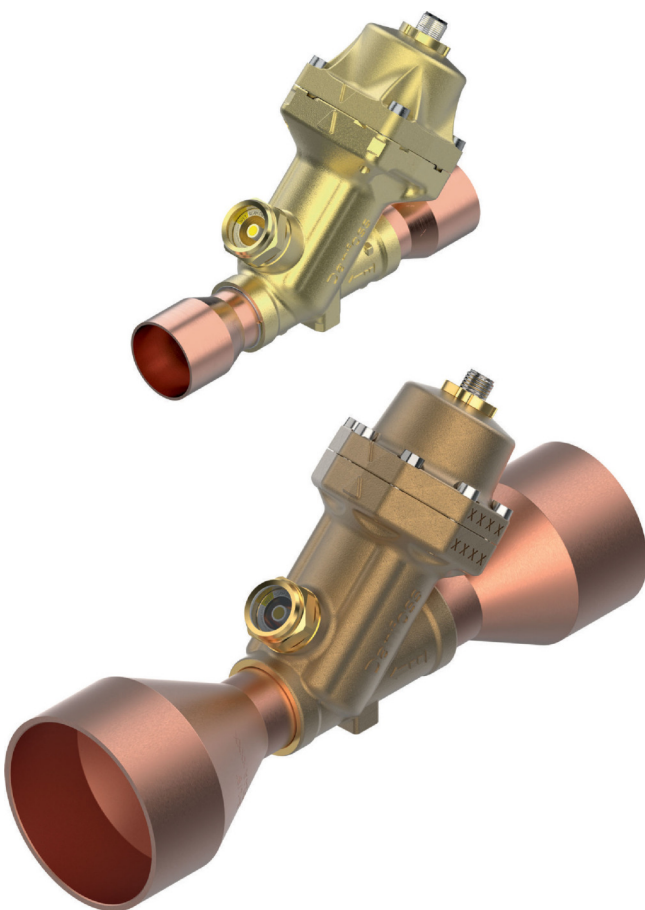


Data Sheet

Electric expansion valve

Type **ETS 175L - 250L - 400L - 500L**

For liquid injection into evaporators



ETS 175L - 250L - 400L - 500L is a series of electric expansion valves for precise liquid injection in to evaporators for air conditioning and refrigeration applications. The valve comes with two piston options, a linear and a S-shaped characteristics. The design is fully balanced, providing bi-flow feature as well as tight shut-off function in both flow directions. The valve design uses bi-polar drive providing very precise flow regulation.

ETS 175L - 250L - 400L - 500L valves are compatible with electronic control solutions from Danfoss and other manufacturers.

Features

- Precise positioning for optimal control of liquid injection.
- Wide range for all common refrigerants including A2L.
- Available in oil-free and high temperature version.
- ETS can be operated with flow in both directions.
- Designed with built-in sight glass with moisture indicator.
- Danfoss EKE series, EKF series, MCX are examples of Danfoss controllers with drivers matching the ETS needs.
- For manual operation and service of ETS 175L - 250L - 400L - 500L valves an AST-g service driver is available.

Portfolio overview

ETS 175L - 250L - 400L - 500L is an electric expansion valve series whose function is controlled through a Danfoss electronic controller, or a third party electronic controller that is compatible with the ETS 175L - 250L - 400L - 500L as to control functionality and connections.

Danfoss recommends the use of the EKE 1 series Superheat controllers or EKF driver units together with ETS 175L - 250L - 400L - 500L.

The electronic controller requires precise temperature input from a temperature sensor (refrigerant temperature) and precise pressure inputs (evaporator pressure) from a pressure transmitter.

Table 1: System product






| EKF 1A/2A Stepper Valve Driver | EKE 1 series superheat controllers (EKE 1B is shown) |
|-------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  |  |
| <p>EKF series is an economical stepper valve driver that translates analog signal provided by master controller to valve driving sequence .</p> | <p>EKE superheat controllers are for DIN rail mounting, and comes in three versions with different combinations of inputs and output relays and different functionality.</p> |

Table 2: Sensors and other products for Type ETS 175L - 250L - 400L - 500L

| Pressure transmitter (DST P1 10 shown) | Temperature sensor (AKS 12 shown) | Backup power module EKE 2U |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
|  |  |  |
| <p>DST P110 is a digital ratiometric pressure transmitter. Depending on controller type, other ratiometric pressure transmitters can be used as well (e.g. AKS 32R).</p> | <p>AKS is a PT1000 temperature sensor. Depending on controller type, other temperature sensors can be used as well.</p> | <p>EKE 2U Backup power module ensures sufficient power in case of power failures to the controller to ensure closure of the electronic valves .</p> |

Functions

Valve operation

The ETS 175L - 250L - 400L - 500L valves operate modulating by electronically controlled activation of the stepper motor. The motor is a type 2-phase bi-polar, which stays in position, unless power pulses from a driver initiate the two discrete sets of motor stator windings for rotation in either directions. The direction of the rotation of the spindle depends on the phase relationship of the power pulses. This is decisive for the travel of the piston.

The motor is operating the spindle, whose rotating movements are transformed into linear motion by the transmission in the cage assembly. The motor housing has a glass sealed M12 connection as standard, which can be connected with a M12 A code 4-pin connector.

The piston design inside the ETS 175L - 250L - 400L - 500L valve is pressure balanced, giving identical bi-flow performance capabilities and nearby identical maximum capacities. Closing the valve by overdriving, ensures that the reference number in steps is always correct.

NOTE:

Depending on the type of controller or driver, there will be limitations in cable length between valve actuator and driver. Both the actual cable length, the level of EMC emission on the location and driver circuit has an impact on the actual distortion of the current to the actuator motor.

Do not overdrive the valve in open position. Please contact Danfoss for further information how and when to apply this counter measure in cases with questionable cable length.

Sight glass and indicator

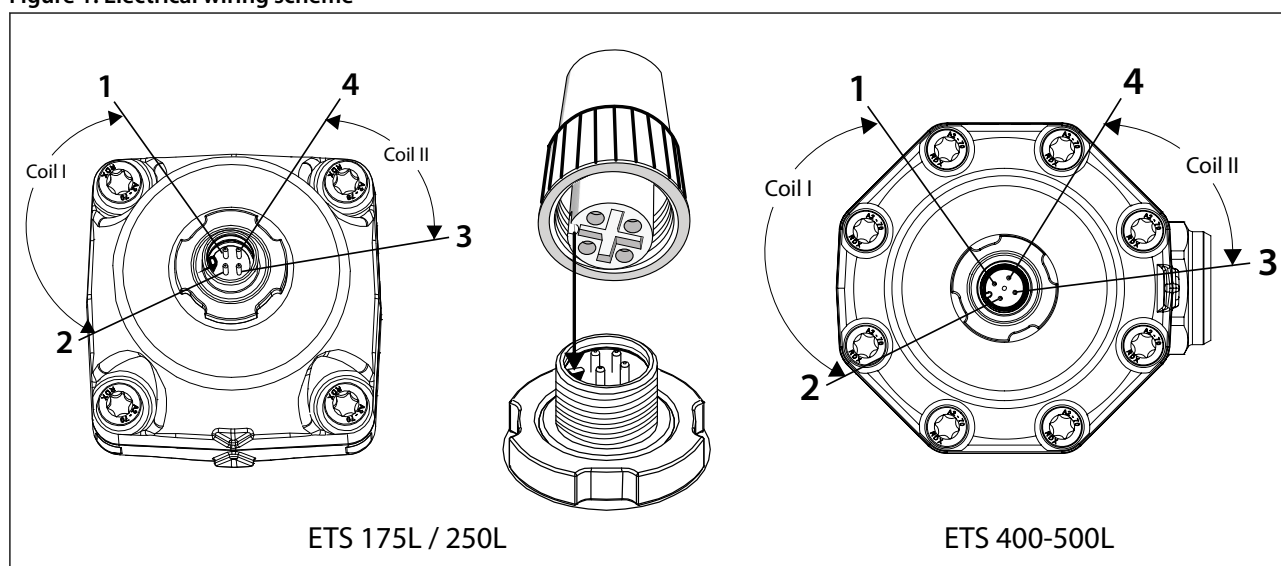
ETS 175L - 250L - 400L - 500L are equipped with sight glass with moisture indicator. The physical position of the valve can be checked through the sight glass.

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.

Some variants comes without sight-glass and indicator, check section ordering for details.

Electrical wiring

Figure 1: Electrical wiring scheme



NOTE:

Electrical check of stepper motor and wiring coil I = 52 ohm, coil II = 52 ohm

Stepper motor switch sequence

Table 3: Stepper motor switch sequence

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

If the controller driving the ETS 175L - 250L - 400L - 500L valves is from another manufacturer than Danfoss or a custom design,

the following points must be considered in order to overcome potential step loss.

1. To ensure total closing of the valve, the controller should have a function to overdrive the valve in the closed direction. It is recommended to overdrive 5% of the full step range at appropriate intervals. Overdrive should not be performed in open direction of the valve.
2. 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 step after a defined number of changes in opening degree.

⚠ WARNING:

At power failure the ETS 175L - 250L - 400L - 500L valves 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. Danfoss recommends to use EKE 2U backup power module.

Table 4: Design elements

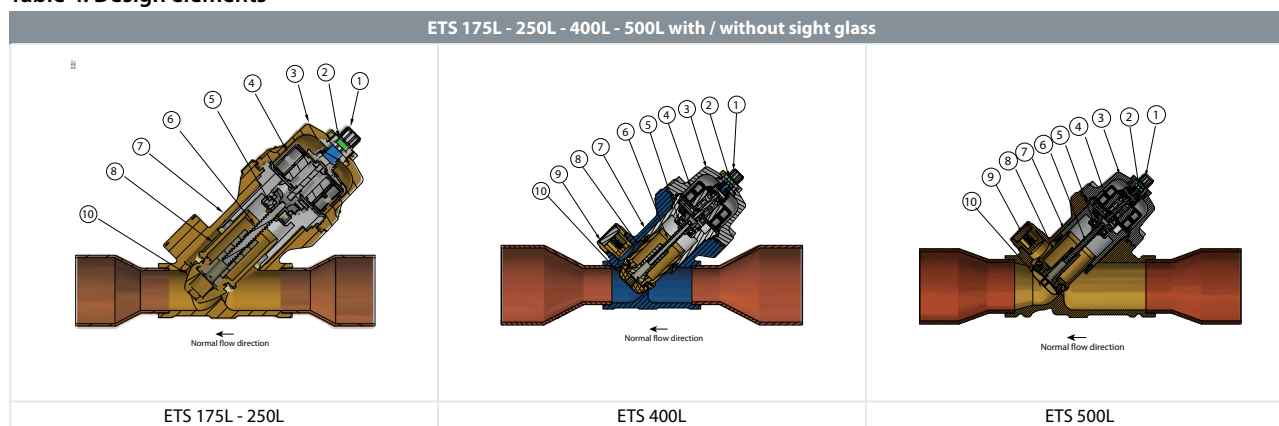
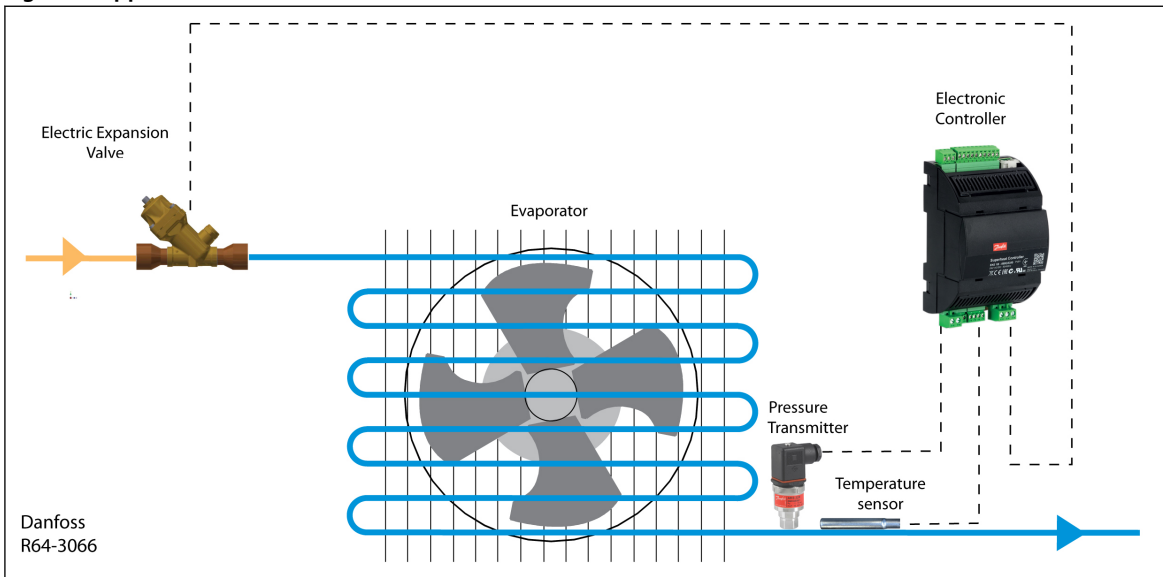


Table 5: Design

| Pos. no. | ETS 175L - 250L - 400L - 500L |
|----------|-------------------------------|
| 1 | M12 connector |
| 2 | Glass seal |
| 3 | Cover |
| 4 | Stepper motor |
| 5 | Bearing |
| 6 | Spindle |
| 7 | Valvehousing |
| 8 | Piston |
| 9 | Sight glass |
| 10 | Cone |

Applications

Figure 2: Applications



Media

ETS L series is designed to be used with the below shown refrigerants and lubricants.

Table 6: Refrigerants and lubricants

| Media Data | Value |
|--------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Refrigerants | R22, R134a, R404A, R407A, R407C, R407F, R407H, R410A, R417A, R422A, R422B, R422D, R438A, R442A, R448A, R449A, R449B, R450A, R452A, R463A, R507A, R513A, R513B, R515A, R515B, R1234ze(E), R1234yf ⁽¹⁾ , R516A ⁽¹⁾ |
| Refrigerant oil for ETS 175L - 250L - 400L | POE, PVE, mineral oil |
| Refrigerant oil for 500L | POE, PVE ⁽²⁾ |
| Oil free and high temperature application | Yes |
| Media temperature range | -40 – +70 °C (max. +95 °C for oil-free and high temperature version) -40 – +95 °C (for ETS 500L) |

⁽¹⁾ only for oil free valves ETS 175L and 250L

⁽²⁾ Please don't use the ETS 500L and oil-free variants in system with mineral oil because there is the risk of external leakage

Refrigerant safety class (ASHRAE Standard 34/ISO 817)

NOTE:

For flammable refrigerants R1234ze(E), R1234yf, R516A :

- This product is validated in accordance to EN 378, ISO 5149, ASHRAE 15 or equivalent standards.
- Ignition risk is evaluated in accordance to ISO 5149.
- See safety note below.

NOTE:

- The product can be applied on systems with R1234ze(E), R1234yf, R516A as the working fluid.
- For countries where safety standards are not an indispensable part of the safety system Danfoss recommend the installer to get a third party approval of the system containing flammable refrigerant.
- Note, please follow specific selection criteria stated in the datasheet for these particular refrigerants.
- The valve must only be used in closed circuit refrigeration system, where no oxygen is present acc. EN 378, ISO 5149 ASHRAE 15 or equivalent standards.

Product specification

Valve technical specifications

Table 7: Electrical specification

| Valve technical specification | Value |
|---------------------------------------|---------------------------------------------------------------------------------------------------------------|
| Motor type | Bi-Polar |
| Coil resistance @ 25C | 52.4 ohm +- 10% |
| Nominal voltage | Constant Voltage drive: 12V -4/+15% |
| Phase current | Chopper drive: 200 mA recommended |
| Phase inductance | 70 mH +- 20% |
| Power consumption | Voltage / current drive: 5.5 / 4.2 W (UL: NEC class 2) |
| Holding current | Not needed |
| Excitation methods | Full step, Half step and micro stepping |
| Number of steps | 3810 -0/+400 Full steps (ETS 175L - 250L - 400L), 4999 Full steps (ETS 500L) |
| Nominal step rate | Constant voltage drive: max. 100pps recommended Chopper drive: max 300pps |
| Travel time | <13 sec @ 300pps <17 sec @ 300pps (for ETS 500L) |
| Max duty cycle | 100% possible, requiring refrigerant flow through valve. (max. 50% for oil-free and high temperature version) |
| Dielectric strength | >100MΩ at 500VDC after 4 seconds |
| Minimum stable control opening degree | 10% of opening degree |
| Reference position | Overdriving against the full close position |
| Valve configuration | Inline, Straightway |
| Electrical connections | M12 A-code 4 pin |
| Compatible Danfoss controllers | Danfoss EKE 1 series superheat controllers, EKF drivers, AK-XM 208C, MCX series |

Valve Specification

Table 8: Valve Specification

| Data | Value (SI units) | Value (IMP units) |
|-----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| Max working pressure (MWP) | 37 barg | 537 Psig |
| Maximum operating pressure differential (MOPD, measured at initial opening) | normal flow: 26 barg | normal flow: 377 psig |
| | reverse flow: | reverse flow: |
| | 175L: 26 bar g both Voltage and current driven | 175L: 377 psig both Voltage and current driven |
| | 250L: 12 barg voltage driven | 250L: 174 psig voltage driven |
| | 250L: 17 barg current driven | 250L: 246.5 psig current driven |
| Ambient temperature | 400L: 10 barg both Voltage and current driven | 400L: 145 psig both Voltage and current driven |
| | 500L: 10 barg both Voltage and current driven | 500L: 145 psig both Voltage and current driven |
| Ambient relative humidity | -40 °C to 70 °C | -40 °F to 158 °F |
| Ambient relative humidity | Max 95% RH | Max 95% RH |
| Inlet fluid temperature range | -40 – +70 °C -40 – +95 °C (for ETS 500L) (max. +95 °C for oil-free and high temperature version) | -40 – +158 °F -40 – +203 °F (for ETS 500L) (max. +203 °F for oil-free and high temperature version) |
| Flow direction | Bi-Flow | |
| Sightglass / moisture indicator | Type N moisture indicator | |
| Max, external leakage @37bar @20C with 100% helium | 1.56*10 ⁻⁵ mbarL/s | |
| Enclosure rating IP | IP67 | |
| Insulation resistance | >100 MΩ | |
| Storage temperature range (°C) | ~30 °C to 70 °C | |
| Shipping and Shelf life | EC 60068-2-30 (damp heat, cyclic), at 25/55 °C. valve in packaging | |

| Installation data | Value |
|------------------------------|-------------------|
| Installation orientation | Vertical +90° |
| Ex-factory delivery position | 90° open position |

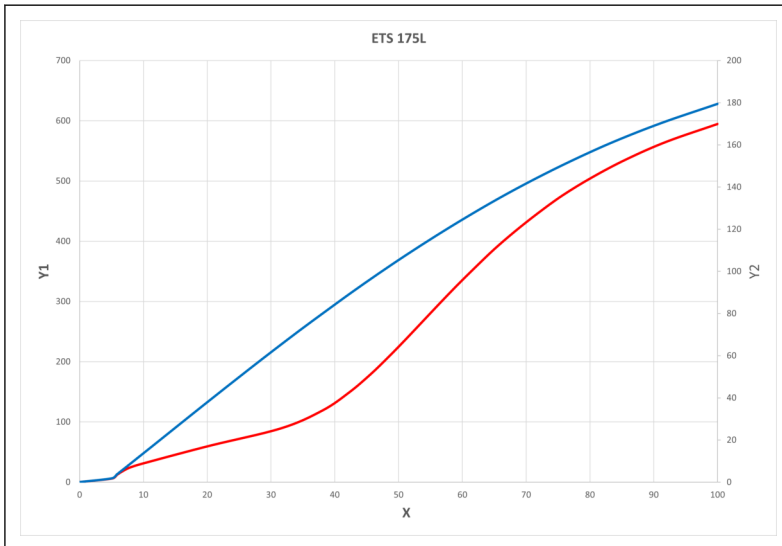
Identification

Figure 3: Identification (example)



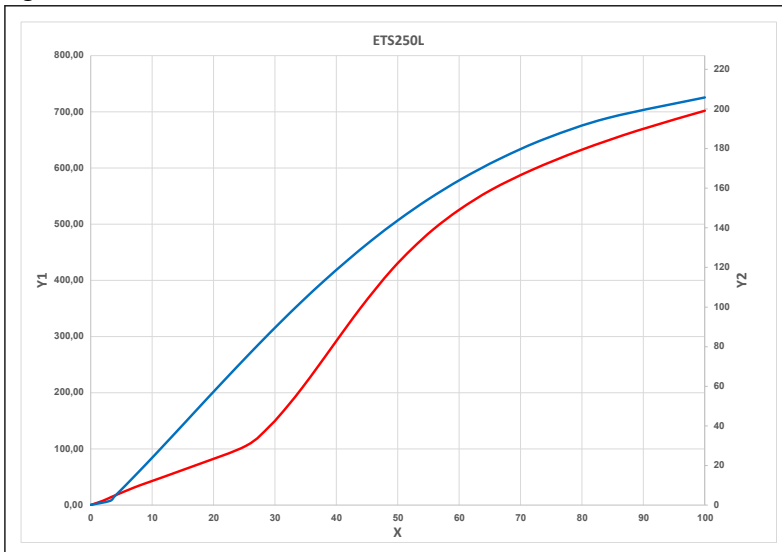
Flow characteristics

Figure 4: ETS 175L flow curves



| | |
|----------|---------------------|
| X | Number of steps [%] |
| Y1 | Capacity [kW] |
| Y2 | Capacity [TR] |
| — (red) | ETS 175L S curve |
| — (blue) | ETS 175L L curve |

Figure 5: ETS 250L flow curves

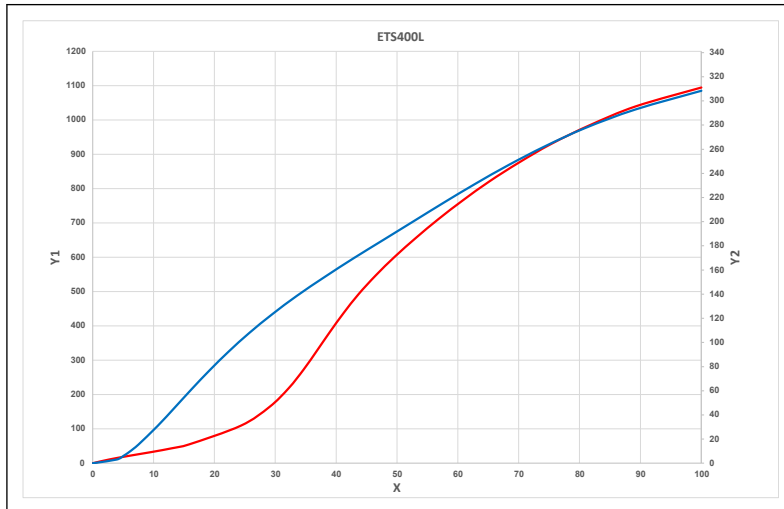


| | |
|----------|---------------------|
| X | Number of steps [%] |
| Y1 | Capacity [kW] |
| Y2 | Capacity [TR] |
| — (red) | ETS 250L S curve |
| — (blue) | ETS 250L L curve |

Electric expansion valve, Type ETS 175L - 250L - 400L - 500L

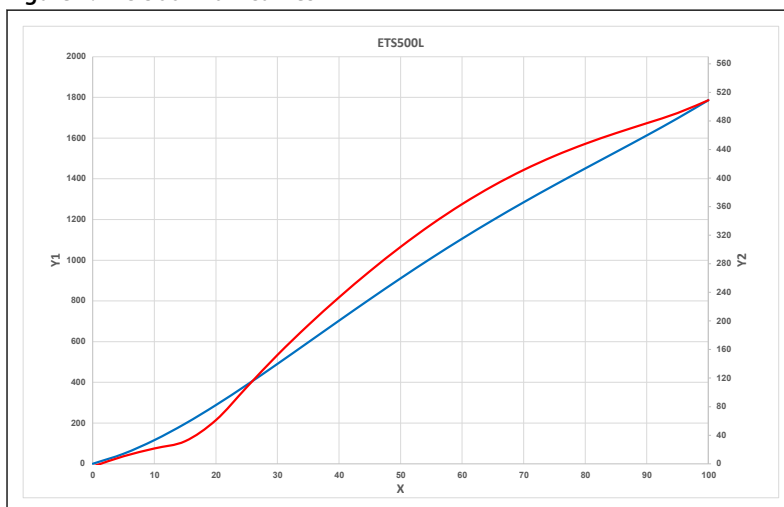
- Evaporating temperature t_e : 5 °C / 40 °F
- Liquid temperature t_l : 28 °C / 82 °F
- Condensing temperature t_c : 32 °C / 90 °F
- Valve position provided by pulses in full steps
- Flow direction: Normal flow

Figure 6: ETS 400L flow curves



| | |
|----|---------------------|
| X | Number of steps [%] |
| Y1 | Capacity [kW] |
| Y2 | Capacity [TR] |
| — | ETS 400L S curve |
| — | ETS 400L L curve |

Figure 7: ETS 500L flow curves



| | |
|----|---------------------|
| X | Number of steps [%] |
| Y1 | Capacity [kW] |
| Y2 | Capacity [TR] |
| — | ETS 500L S curve |
| — | ETS 500L L curve |

Dimensions

Figure 8: Dimensions ETS 175L - 250L

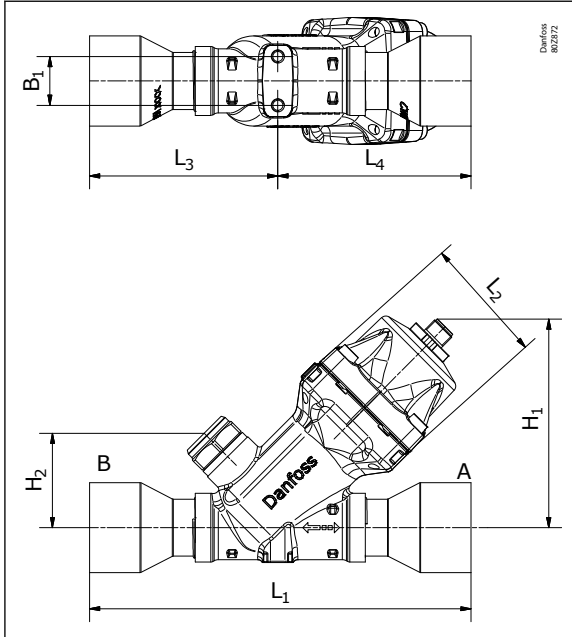


Figure 9: Dimensions ETS 400L

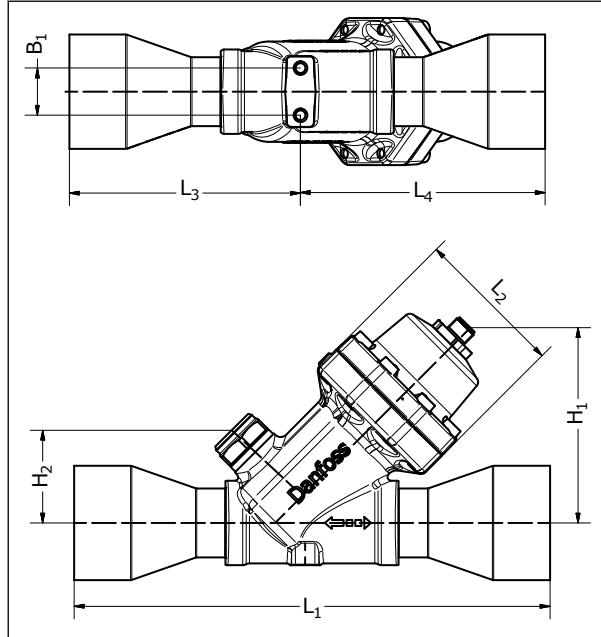
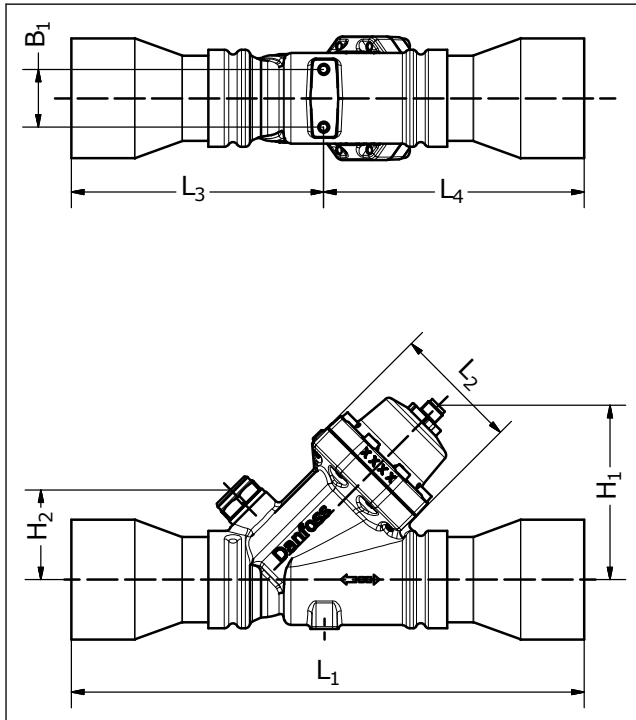


Figure 10: Dimensions ETS 500L



Electric expansion valve, Type ETS 175L - 250L - 400L - 500L

Table 9: Dimensions

| Type | Sight glass | Connections | | B ₁ | | H ₁ | | H ₂ | | L ₁ | | L ₂ | | L ₃ | | L ₄ | | Net Weight | |
|----------|-------------|-------------------|---------|----------------|------|----------------|------|----------------|------|----------------|-------|----------------|------|----------------|-------|----------------|------|------------|------|
| | | ODF x ODF (A x B) | | [in.] | [mm] | [in.] | [mm] | [in.] | [mm] | [in.] | [mm] | [in.] | [mm] | [in.] | [mm] | [in.] | [mm] | [kg] | [lb] |
| | | [in.] | [mm] | | | | | | | | | | | | | | | | |
| ETS 175L | Yes | 1 1/8 X 1/8 | 29 X 29 | 0.9 | 24.0 | 3.9 | 98.8 | 1.8 | 46.4 | 6.6 | 167.5 | 2.5 | 62.5 | 3.2 | 82.5 | 3.3 | 85.0 | 1.83 | 4.03 |
| | No | 1 1/8 X 1/8 | 29 X 29 | 0.9 | 24.0 | 3.9 | 98.8 | 1.5 | 38.1 | 6.6 | 167.5 | 2.5 | 62.5 | 3.2 | 82.5 | 3.3 | 85.0 | 1.83 | 4.03 |
| | Yes | 1 3/8 X 1/3/8 | 35 X 35 | 0.9 | 24.0 | 3.9 | 98.8 | 1.8 | 46.4 | 7.0 | 177.5 | 2.5 | 62.5 | 3.4 | 87.5 | 3.5 | 90.0 | 1.83 | 4.03 |
| | Yes | 1 5/8 X 1/5/8 | 41 X 41 | 0.9 | 24.0 | 3.9 | 98.8 | 1.8 | 46.4 | 7.4 | 187.5 | 2.5 | 62.5 | 3.6 | 92.5 | 3.7 | 95.0 | 1.83 | 4.03 |
| | Yes | 1 21/32 X 1 21/32 | 42 X 42 | 0.9 | 24.0 | 3.9 | 98.8 | 1.8 | 46.4 | 7.4 | 187.5 | 2.5 | 62.5 | 3.6 | 92.5 | 3.7 | 95.0 | 1.83 | 4.03 |
| ETS 250L | Yes | 1 1/8 X 1/8 | 29 X 29 | 0.9 | 24.0 | 3.9 | 98.8 | 1.8 | 46.4 | 6.6 | 167.5 | 2.5 | 62.5 | 3.2 | 82.5 | 3.3 | 85.0 | 1.84 | 4.06 |
| | Yes | 1 3/8 X 1/3/8 | 35 X 35 | 0.9 | 24.0 | 3.9 | 98.8 | 1.8 | 46.4 | 7.0 | 177.5 | 2.5 | 62.5 | 3.4 | 87.7 | 3.5 | 90.0 | 1.84 | 4.06 |
| | Yes | 1 5/8 X 1/5/8 | 41 X 41 | 0.9 | 24.0 | 3.9 | 98.8 | 1.8 | 46.4 | 7.4 | 187.5 | 2.5 | 62.5 | 3.6 | 92.5 | 3.7 | 95.0 | 1.84 | 4.06 |
| | Yes | 1 5/8 X 2/1/8 | 41 X 54 | 0.9 | 24.0 | 3.9 | 98.8 | 1.8 | 46.4 | 8.0 | 202.0 | 2.5 | 62.5 | 8.0 | 107.0 | 3.7 | 95.0 | 1.84 | 4.06 |
| | Yes | 1 21/32 X 1 21/32 | 42 X 42 | 0.9 | 24.0 | 3.9 | 98.8 | 1.8 | 46.4 | 7.4 | 187.5 | 2.5 | 62.5 | 3.6 | 92.5 | 3.7 | 95.0 | 1.84 | 4.06 |
| | No | 1 21/32 X 1 21/32 | 42 X 42 | 0.9 | 24.0 | 3.9 | 98.8 | 1.5 | 38.1 | 7.4 | 187.5 | 2.5 | 62.5 | 3.6 | 92.5 | 3.7 | 95.0 | 1.84 | 4.06 |
| ETS 400L | Yes | 1 5/8 X 1/5/8 | 41 X 41 | 0.9 | 24.0 | 4.0 | 101 | 1.9 | 47 | 7.9 | 202 | 3.0 | 76 | 3.8 | 98 | 4.1 | 104 | 2.35 | 5.18 |
| | Yes | 2 1/8 X 2/1/8 | 54 X 54 | 0.9 | 24.0 | 4.0 | 101 | 1.9 | 47 | 9.5 | 242 | 3.0 | 76 | 4.6 | 118 | 4.9 | 124 | 2.35 | 5.18 |
| | Yes | 2 5/8 X 2/5/8 | 67 X 67 | 0.9 | 24.0 | 4.0 | 101 | 1.9 | 47 | 10.7 | 272 | 3.0 | 76 | 5.2 | 132 | 5.5 | 139 | 2.65 | 5.18 |
| ETS 500L | Yes | 2 5/8 X 3/1/8 | 67 X 79 | 1.4 | 35 | 4.2 | 106 | 2.1 | 54 | 12.7 | 323 | 3 | 76 | 6.5 | 165 | 6.2 | 158 | 3.72 | 8.2 |
| | Yes | 2 5/8 X 2/5/8 | 67 X 67 | 1.4 | 35 | 4.2 | 106 | 2.1 | 54 | 12.2 | 311 | 3 | 76 | 6 | 153 | 6.2 | 158 | 3.72 | 8.2 |
| | Yes | 3 1/8 X 3/1/8 | 79 X 79 | 1.4 | 35 | 4.2 | 106 | 2.1 | 54 | 13.2 | 335 | 3 | 76 | 6.5 | 165 | 6.7 | 170 | 3.72 | 8.2 |
| | Yes | 2 5/8 X 3/1/8 | 67 X 79 | 1.4 | 35 | 4.2 | 106 | 2.1 | 54 | 12.7 | 323 | 3 | 76 | 6.5 | 165 | 6.2 | 158 | 3.72 | 8.2 |
| | Yes | 2 5/8 X 2/5/8 | 67 X 67 | 1.4 | 35 | 4.2 | 106 | 2.1 | 54 | 12.2 | 311 | 3 | 76 | 6 | 153 | 6.2 | 158 | 3.72 | 8.2 |
| | Yes | 3 1/8 X 3/1/8 | 79 X 79 | 1.4 | 35 | 4.2 | 106 | 2.1 | 54 | 13.2 | 335 | 3 | 76 | 6.5 | 165 | 6.7 | 170 | 3.72 | 8.2 |

Ordering

Table 10: Ordering standard version

| Type | Linear/S-shape | Built-in sight glass | Rated capacity | | | | | | | | Connections | | Code no. | |
|----------|----------------|----------------------|----------------|------|------------|------|-------|------|-------|------|---------------|----------|-------------|-----------------|
| | | | R134a | | R1234ze(E) | | R513A | | R515B | | ODF x ODF | | Single pack | Industrial pack |
| | | | (kW) | (TR) | (kW) | (TR) | (kW) | (TR) | (kW) | (TR) | (in) | (mm) | | |
| ETS 175L | Linear | Yes | 631 | 180 | 495 | 142 | 542 | 156 | 481 | 139 | 1-1/8 x 1-1/8 | | 034G3602 | |
| | S-shape | Yes | 595 | 169 | 467 | 134 | 510 | 147 | 454 | 131 | 1-1/8 x 1-1/8 | | 034G3624 | |
| | Linear | No | 631 | 180 | 495 | 142 | 542 | 156 | 481 | 139 | 1-1/8 x 1-1/8 | | 034G3604 | |
| | Linear | Yes | 631 | 180 | 495 | 142 | 542 | 156 | 481 | 139 | 1-3/8 x 1-3/8 | | | 034G3603 |
| | Linear | No | 631 | 180 | 495 | 142 | 542 | 156 | 481 | 139 | 1-3/8 x 1-3/8 | | 034G3625 | |
| | Linear | Yes | 631 | 180 | 495 | 142 | 542 | 156 | 481 | 139 | 1-3/8 x 1-3/8 | | 034G3600 | |
| | S-shape | Yes | 595 | 169 | 467 | 134 | 510 | 147 | 454 | 131 | 1-3/8 x 1-3/8 | | 034G3601 | |
| | Linear | Yes | 631 | 180 | 495 | 142 | 542 | 156 | 481 | 139 | 1-5/8 x 1-5/8 | | 034G3626 | |
| | S-shape | Yes | 595 | 169 | 467 | 134 | 510 | 147 | 454 | 131 | 1-5/8 x 1-5/8 | | 034G3627 | |
| | Linear | Yes | 631 | 180 | 495 | 142 | 542 | 156 | 481 | 139 | | 42 x 42 | 034G3628 | |
| S-shape | Yes | 595 | 169 | 467 | 134 | 510 | 147 | 454 | 131 | | 42 x 42 | 034G3629 | | |
| ETS 250L | Linear | Yes | 724 | 206 | 567 | 163 | 622 | 179 | 551 | 158 | 1-1/8 x 1-1/8 | | 034G3616 | |
| | S-shape | Yes | 701 | 200 | 558 | 160 | 612 | 176 | 543 | 156 | 1-1/8 x 1-1/8 | | 034G3617 | |
| | Linear | Yes | 724 | 206 | 567 | 163 | 622 | 179 | 551 | 158 | 1-3/8 x 1-3/8 | | 034G3607 | |
| | S-shape | Yes | 701 | 200 | 558 | 160 | 612 | 176 | 543 | 156 | 1-3/8 x 1-3/8 | | 034G3608 | |
| | Linear | Yes | 724 | 206 | 567 | 163 | 622 | 179 | 551 | 158 | 1-3/8 x 1-3/8 | | | 034G3610 |
| | Linear | Yes | 724 | 206 | 567 | 163 | 622 | 179 | 551 | 158 | 1-5/8 x 1-5/8 | | 034G3605 | |
| | Linear | Yes | 724 | 206 | 567 | 163 | 622 | 179 | 551 | 158 | 1-5/8 x 1-5/8 | | | 034G3609 |
| | Linear | No | 724 | 206 | 567 | 163 | 622 | 179 | 551 | 158 | 1-5/8 x 1-5/8 | | 034G3618 | |
| | S-shape | Yes | 701 | 200 | 558 | 160 | 612 | 176 | 543 | 156 | 1-5/8 x 1-5/8 | | 034G3606 | |
| | Linear | Yes | 724 | 206 | 567 | 163 | 622 | 179 | 551 | 158 | 1-5/8 x 2-1/8 | | 034G3619 | |
| | S-shape | Yes | 701 | 200 | 558 | 160 | 612 | 176 | 543 | 156 | 1-5/8 x 2-1/8 | | 034G3620 | |
| | Linear | Yes | 724 | 206 | 567 | 163 | 622 | 179 | 551 | 158 | | 42 x 42 | 034G3621 | |
| | S-shape | Yes | 701 | 200 | 558 | 160 | 612 | 176 | 543 | 156 | | 42 x 42 | 034G3622 | |
| | Linear | No | 724 | 206 | 567 | 163 | 622 | 179 | 551 | 158 | | 42 x 42 | 034G3611 | |
| | S-shape | No | 701 | 200 | 558 | 160 | 612 | 176 | 543 | 156 | | 42 x 42 | 034G3623 | |
| | Linear | Yes | 724 | 206 | 567 | 163 | 622 | 179 | 551 | 158 | 2-1/8 x 2-1/8 | | 034G3637 | |
| | S-shape | Yes | 701 | 200 | 558 | 160 | 612 | 176 | 543 | 156 | 2-1/8 x 2-1/8 | | 034G3638 | |
| | S-shape | No | 701 | 200 | 558 | 160 | 612 | 176 | 543 | 156 | | 42 x 42 | | 034G3670 |
| | S-shape | Yes | 701 | 200 | 558 | 160 | 612 | 176 | 543 | 156 | 1-3/8 x 1-3/8 | | | 034G3671 |
| | S-shape | Yes | 701 | 200 | 558 | 160 | 612 | 176 | 543 | 156 | 1-5/8 x 1-5/8 | | | 034G3672 |
| ETS 400L | S-shape | Yes | 1095 | 311 | 854 | 246 | 943 | 271 | 830 | 239 | 1-5/8 x 1-5/8 | | 034G3630 | |
| | S-shape | Yes | 1095 | 311 | 854 | 246 | 943 | 271 | 830 | 239 | 2-1/8 x 2-1/8 | | 034G3631 | |
| | Linear | Yes | 1085 | 308 | 846 | 243 | 934 | 269 | 823 | 237 | 1-5/8 x 1-5/8 | | 034G3632 | |
| | Linear | Yes | 1085 | 308 | 846 | 243 | 934 | 269 | 823 | 237 | 2-1/8 x 2-1/8 | | 034G3633 | |
| | Linear | Yes | 1085 | 308 | 846 | 243 | 934 | 269 | 823 | 237 | 1-5/8 x 1-5/8 | | | 034G3634 |
| | Linear | Yes | 1085 | 308 | 846 | 243 | 934 | 269 | 823 | 237 | 2-1/8 x 2-1/8 | | | 034G3635 |
| | Linear | Yes | 1085 | 308 | 846 | 243 | 934 | 269 | 823 | 237 | 2-1/8 x 2-5/8 | | 034G3677 | |
| | Linear | Yes | 1085 | 308 | 846 | 243 | 934 | 269 | 823 | 237 | 2-5/8 x 2-5/8 | | 034G3636 | |
| | S-shape | Yes | 1095 | 311 | 854 | 246 | 943 | 271 | 830 | 239 | 1-5/8 x 1-5/8 | | | 034G3673 |
| | S-shape | Yes | 1095 | 311 | 854 | 246 | 943 | 271 | 830 | 239 | 2-1/8 x 2-1/8 | | | 034G3674 |
| ETS 500L | S-shape | Yes | 1786 | 507 | 1396 | 402 | 1535 | 442 | 1357 | 390 | 2-1/8 x 2-5/8 | | 034G3694 | |
| | Linear | Yes | 1786 | 507 | 1396 | 402 | 1535 | 442 | 1357 | 390 | 2-1/8 x 2-5/8 | | 034G3695 | |
| | S-shape | Yes | 1786 | 507 | 1396 | 402 | 1535 | 442 | 1357 | 390 | 2-5/8 X 3-1/8 | | 034G3661 | |
| | S-shape | Yes | 1786 | 507 | 1396 | 402 | 1535 | 442 | 1357 | 390 | 2-5/8 X 2-5/8 | | 034G3662 | |
| | S-shape | Yes | 1786 | 507 | 1396 | 402 | 1535 | 442 | 1357 | 390 | 3-1/8 X 3-1/8 | | 034G3663 | |
| | Linear | Yes | 1786 | 507 | 1396 | 402 | 1535 | 442 | 1357 | 390 | 2-5/8 X 3-1/8 | | 034G3664 | |
| | Linear | Yes | 1786 | 507 | 1396 | 402 | 1535 | 442 | 1357 | 390 | 2-5/8 X 2-5/8 | | 034G3665 | |
| | Linear | Yes | 1786 | 507 | 1396 | 402 | 1535 | 442 | 1357 | 390 | 3-1/8 X 3-1/8 | | 034G3666 | |

Table 11: Ordering oil-free and high temperature version:

| Type | Linear/S-shape | Built-in sight glass | Rated capacity | | | | | | Connections | | Code no. | |
|----------|----------------|----------------------|----------------|------|-------|------|-------|------|---------------|-----------|-------------|-----------------|
| | | | R1234ze(E) | | R513A | | R515B | | ODF x ODF | ODM x ODM | Single pack | Industrial pack |
| | | | (kW) | (TR) | (kW) | (TR) | (kW) | (TR) | (in) | (mm) | | |
| ETS 175L | Linear | Yes | 495 | 142 | 542 | 156 | 481 | 139 | 1-3/8 x 1-3/8 | | 034G3650 | |
| | Linear | Yes | 495 | 142 | 542 | 156 | 481 | 139 | 1-1/8 x 1-1/8 | | 034G3651 | |
| | Linear | Yes | 495 | 142 | 542 | 156 | 481 | 139 | 1-5/8 x 1-5/8 | | | 034G3693 |
| ETS 250L | Linear | Yes | 567 | 163 | 622 | 179 | 551 | 158 | 1-1/8 x 1-1/8 | | 034G3688 | |
| | S-shape | Yes | 558 | 160 | 612 | 176 | 543 | 156 | 1-1/8 x 1-1/8 | | 034G3689 | |
| | Linear | Yes | 567 | 163 | 622 | 179 | 551 | 158 | 1-3/8 x 1-3/8 | | 034G3654 | |
| | S-shape | Yes | 558 | 160 | 612 | 176 | 543 | 156 | 1-3/8 x 1-3/8 | | 034G3652 | |
| | Linear | Yes | 567 | 163 | 622 | 179 | 551 | 158 | 1-5/8 x 1-5/8 | | 034G3653 | |
| | S-shape | Yes | 558 | 160 | 612 | 176 | 543 | 156 | 1-5/8 x 1-5/8 | | 034G3655 | |
| | Linear | Yes | 567 | 163 | 622 | 179 | 551 | 158 | 1-5/8 x 1-5/8 | | 034G3658 | |
| ETS 400L | S-shape | Yes | 854 | 246 | 943 | 271 | 830 | 239 | 1-5/8 x 1-5/8 | | 034G3656 | |
| | Linear | Yes | 846 | 243 | 934 | 269 | 823 | 237 | 2-1/8 x 2-1/8 | | 034G3659 | |
| | S-shape | Yes | 854 | 246 | 943 | 271 | 830 | 239 | 2-1/8 x 2-1/8 | | 034G3657 | |
| | Linear | Yes | 846 | 243 | 934 | 269 | 823 | 237 | 2-5/8 x 2-5/8 | | 034G3660 | |
| | S-shape | Yes | 854 | 246 | 943 | 271 | 830 | 239 | | 35 x 35 | | 034G3667 |
| | Linear | Yes | 846 | 243 | 934 | 269 | 823 | 237 | | 35 x 35 | | 034G3686 |
| | S-shape | Yes | 1396 | 402 | 1535 | 442 | 1357 | 390 | 2-5/8 x 2-5/8 | | 034G3668 | |
| ETS 500L | Linear | Yes | 1396 | 402 | 1535 | 442 | 1357 | 390 | 2-5/8 x 2-5/8 | | 034G3669 | |
| | S-shape | Yes | 1396 | 402 | 1535 | 442 | 1357 | 390 | 3-1/8 x 3-1/8 | | 034G3678 | |
| | Linear | Yes | 1396 | 402 | 1535 | 442 | 1357 | 390 | 3-1/8 x 3-1/8 | | 034G3679 | |
| | Linear | Yes | 1396 | 402 | 1535 | 442 | 1357 | 390 | | 52 x 52 | 034G3691 | |
| | S-shape | Yes | 1396 | 402 | 1535 | 442 | 1357 | 390 | | 52 x 52 | 034G3692 | |
| | S-shape | Yes | 1396 | 402 | 1535 | 442 | 1357 | 390 | | 52 x 52 | 034G3692 | |

NOTE:

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



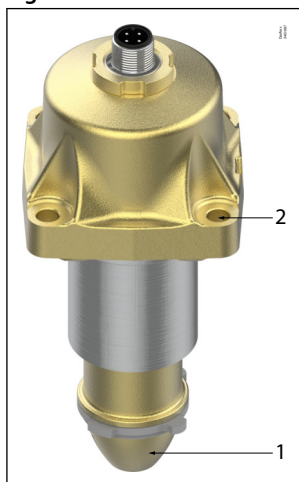
Valve sizing using calculation software

It is strongly recommended to use Coolselector®2 to find the correct valve for your application. The software can be downloaded from the Danfoss website. You can download it from [http:// coolselector.danfoss.com](http://coolselector.danfoss.com)

Spare parts for ETS valve

Actuator kits

Figure 11: ETS 175L - ETS 250L



| | |
|---|------------------------------|
| 1 | Piston i.e Linear or S-curve |
| 2 | Position for Screw (x4) |

Table 12: Actuator kit

| Code no. | 034G3612 | 034G3613 | 034G3614 | 034G3615 |
|----------|-----------------------------|-----------------------------|-----------------------------|----------------------------------------------|
| Item | ETS175L-linear-Actuator kit | ETS175L-SCurve-Actuator kit | ETS250L-linear-Actuator kit | ETS250L-SCurve-Actuator kit |
| Parts | | | | |
| 1 pcs. | | | | Actuator assembly O-ring Screw M6x25mm |
| 1 pcs. | | | | |
| 4 pcs. | | | | |

Table 13: Ordering oil-free and high temperature version:

| Code no. | 034G3644 | 034G3645 | 034G3646 | 034G3647 |
|----------|-----------------------------|-----------------------------|-----------------------------|----------------------------------------------|
| Item | ETS175L-linear-Actuator kit | ETS175L-SCurve-Actuator kit | ETS250L-linear-Actuator kit | ETS250L-SCurve-Actuator kit |
| Parts | | | | |
| 1 pcs. | | | | Actuator assembly O-ring Screw M6x25mm |
| 1 pcs. | | | | |
| 4 pcs. | | | | |

Figure 12: ETS 400L - 500L

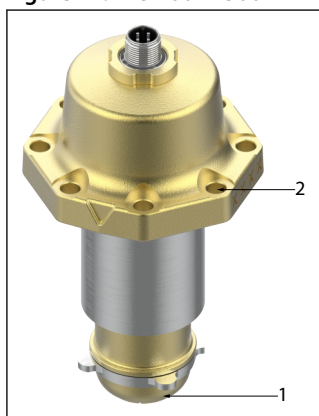


Table 14: Actuator kit

| Code no. | 034G3641 | 034G3642 | 034G3680 | 034G3681 |
|----------|-----------------------------|-----------------------------|-----------------------------|----------------------------------------------|
| Item | ETS400L-linear-Actuator kit | ETS400L-SCurve-Actuator kit | ETS500L-linear-Actuator kit | ETS500L-SCurve-Actuator kit |
| Parts | | | | |
| 1 pcs. | | | | Actuator assembly O-ring Screw M6x25mm |
| 1 pcs. | | | | |
| 8 pcs. | | | | |

Electric expansion valve, Type ETS 175L - 250L - 400L - 500L

Table 15: Ordering oil-free and high temperature version:

| Code no. | 034G3648 | 034G3649 | 034G3682 | 034G3683 |
|----------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
| Item | ETS400L-linear-Actuator kit | ETS400L-SCurve-Actuator kit | ETS500L-linear-Actuator kit | ETS500L-SCurve-Actuator kit |
| Parts | | | | |
| 1 pcs. | | | Actuator assembly | |
| 1 pcs. | | | O-ring | |
| 8 pcs. | | | Screw M6x25mm | |

O-rings

Table 16: O-rings

| Part | Quantity | Description | Code no. |
|--------|----------|----------------------------------------------------------|----------|
| O-ring | 1 pc. | For standard version of ETS 175L - 400L | 034G3640 |
| O-ring | 1 pc. | For standard version of ETS 500L | 034G3643 |
| O-ring | 1 pc. | For oil-free and high temperature version of 175L - 500L | 034G3643 |

Accessories

M12 cable

Figure 13: M12 angle cable dimensions

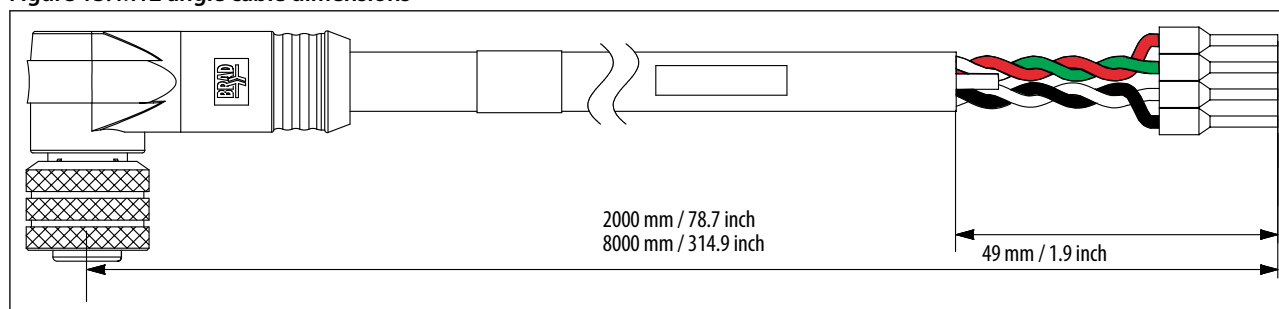


Table 17: M12 cable features

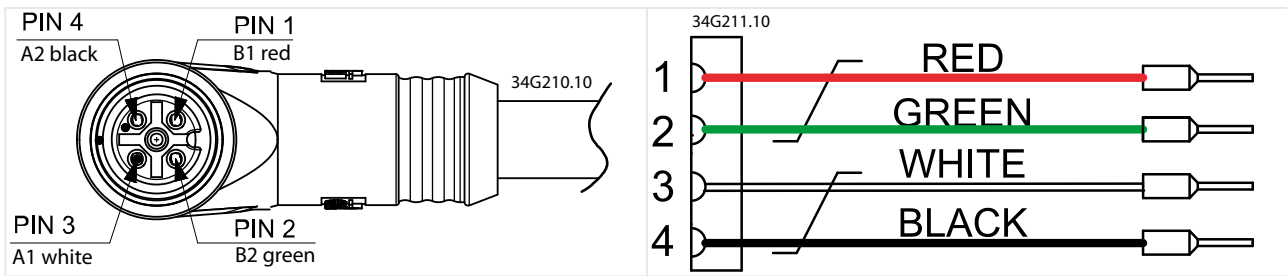
| Cable | Cable length (L) | Insulation | Packing | Code no. |
|----------------|------------------|------------|-------------|----------|
| Angle cable | 2 m / 6.6 ft | SR-PVC | Single pack | 034G7073 |
| Angle cable | 8 m / 26.2 ft | SR-PVC | Single pack | 034G7074 |
| Straight cable | 12.2 m / 40 ft | SR-PVC | Single pack | 034G7078 |

Table 18: Specification

| Future | Description |
|-----------------------------|----------------------------------------------------------|
| Jacket | PVC - black |
| Cable outer sheat | Oil - resistant |
| Water proof rating | IP 67 |
| Operating temperature range | -40 – 80 °C |
| Wire type | Twisted pair, cross section 20 AWG / 0.5 mm ² |
| 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 |

Electric expansion valve, Type ETS 175L - 250L - 400L - 500L

Table 19: Connections



Service driver AST G code 034G0013

Figure 14: Service driver AST G



Troubleshooting

| Symptom | Possible Cause | Remedy |
|---------------------------------------|--------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No valve movement | Lack of proper electrical connection | <ul style="list-style-type: none"> • Check the connection between valve and a controller |
| | Wrong parameter setting in controller | <ul style="list-style-type: none"> • Check valve settings in controller i.e pre-selected valves, no. of steps, phase current, direction of valve rotation, steps per second |
| | Broken motor/ short circuit | <ul style="list-style-type: none"> • Check the resistance between coil I and coil II. Resistance in each coil should be 52.4 ohms @20°C. Details on Electrical wiring • Replace a complete valve |
| | Insufficient power supply to valve | <ul style="list-style-type: none"> • Check the current/voltage supply from controller to valve |
| Internal leakage (due to 'Step Loss') | Control pulse to valve is influenced by high external electrical noise | <ul style="list-style-type: none"> • Separate the cable from high power lines |
| | Longer cable length between valve and controller | <ul style="list-style-type: none"> • Check the maximum cable length allowed between the controller and the valve • For longer cable distance, use cable with bigger wire diameter • Use cable filter |
| | Accumulated backlash in valve | <ul style="list-style-type: none"> • Controller should overdrive the valve to compensate the lost steps after a number of changes in opening degree |
| | Insufficient power supply to the valve | <ul style="list-style-type: none"> • Check the current/voltage supply from controller to valve • Check the supply power to controller |
| Insufficient capacity | Expansion valve too small | <ul style="list-style-type: none"> • Check refrigeration system capacity and compare with expansion valve capacity. Replace with larger valve if necessary |
| | Suction pressure too low Evaporator superheat too high | <ul style="list-style-type: none"> • Check superheat performance, the settings SH min and SH max. in the super heat controller • Check valve capacity • Check 'total number of steps' defined in the controller • Also check section 'High Superheat' |
| | Expansion valve blocked with foreign material Evaporator wholly or partly iced up | <ul style="list-style-type: none"> • Remove and examine the valve • De-ice evaporator |
| High superheat | Lack of sub-cooling | <ul style="list-style-type: none"> • Check refrigerant • Also refer to section Insufficient capacity |
| | Controller is not setup/tuned properly | <ul style="list-style-type: none"> • Check the controller superheat settings and sensors connected to it • Tune PID parameters in the controller |
| Flash gas | Lack of sub-cooling ahead of expansion valve | <ul style="list-style-type: none"> • Check refrigerant for flash gas ahead of expansion valve / external subcooler • If the valve is placed much higher than condenser outlet, check pressure difference |
| | Oversized valve selected | <ul style="list-style-type: none"> • Limit max opening degree of the valve setting in controller • Check refrigeration system capacity and compare with expansion valve capacity. Use proper valve size suitable for the system |

Certificates, declarations and approvals







The list contains all certificates, declarations, and approvals for this product type. Individual code number may have some or all of these approvals, and certain local approvals may not appear on the list.

Some approvals may change over time. You can check the most current status at danfoss.com or contact your local Danfoss representative if you have any questions.

Table 20: Approvals list

| File name | Document type | Document topic | Approval authority |
|-----------------------------------------------|-------------------------------|-----------------------|--------------------|
| EAC RU Д-ДК.БЛ08.В.00191_18 | EAC Declaration | Machinery & Equipment | EAC |
| LLC CDC EURO-TYSK UA.089.D.00188-17 | UA Declaration | PED | LLC CDC EURO TYSK |
| LLC CDC EURO-TYSK UA.TR-089.0993-17 | Pressure - Safety Certificate | PED | LLC CDC EURO TYSK |
| EAC RU Д-ДК.БЛ08.В.00189_18 | EAC Declaration | EMC | EAC |
| EAC RU Д-ДК.АИ30.В.04973 | EAC Declaration | PED | EAC |
| EAC RU Д-ДК.АИ30.В.04995 | EAC Declaration | PED | EAC |
| Manufacturers Declaration Danfoss 034R9813.01 | Manufacturers Declaration | | Danfoss |
| EAC RU Д-ДК.ГА02.В.08524 | EAC Declaration | PED | EAC |

Table 21: Approvals

| | | | | | |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|  |  |  |  |  |  |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|

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