

Installation guide

Injection Controller

Type EKE 110 1V (PV01)



Introduction

Injection controller EKE 110 1V can be used for:

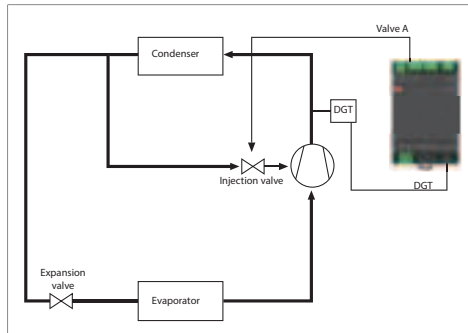
Vapor or wet injection mode (VI/WI): Where controller will manage stepper motor valve in injection of superheated vapor to compressor injection port and automatically switch to wet injection to avoid high discharge gas temperature control (DGT) depending on the running conditions. This enables improved compressor performance on an extended running envelope.

Liquid Injection mode (LI): Where controller will manage stepper motor valve in liquid injection to avoid too high discharge gas temperature control (DGT) depending on the running conditions. This enables compressor to run safe in an extended running envelope. This controller is typically used in light commercial, commercial and industrial low ambient heat pump application.

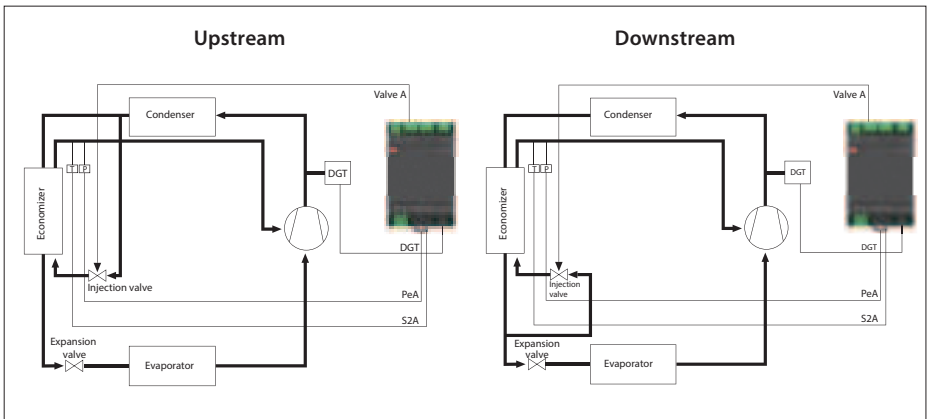
Compatible valves: ETS 6 / ETS 5M Bipolar / ETS 8M Bipolar / ETS Colibri / ETS 175-500L / CCMT L / CCMT / CCM / CTR

Basic application

Liquid injection mode (LI):



Wet and Vapor injection mode (VI/WI):



Technical specification

Supply Voltage	24 V AC/DC* 50/60 Hz, SELV **
Battery backup Input (Danfoss recommends EKE 2U)	24V DC
Number of valve outputs	1 stepper motor valve
Valve type	Bipolar stepper valve
Modbus RS485 RTU	Yes (Isolated)
Baud rate (default setting)	19200
Mode (default setting)	8E1
No of temperature sensors	2(S2A, DGT)
Type of temperature sensors	S2A-PT1000/NTC10K, DGT-PT1000
No of Pressure sensors	1 (PeA)
Type of pressure transmitter***	Ratiometric 0-5-5 V DC, 0-10V, Current 4-20mA
No of digital input	1 (DI1)
Use of digital input****	Start/Stop regulation
Digital output*****	1 output: D0 (open collector), max sink current 10 mA
PC suite	Koolprog
Service tool	EKA 200 + EKE 100 service cable
Mounting	35mm Din rail
Storage temperature	-30 – 80 °C / -22 – 176 °F
Operating temperature	-20 – 70 °C / -4 – 158 °F
Humidity	<90% RH, non-condensing
Enclosure	IP20
Display	No


Note:

- * The unit is suitable for use on a circuit capable of delivering not more than 50A RMS symmetrical Amperes
- ** For US and Canada, use class 2 power supply
- *** Pressure transmitter output supply voltage upto 18V/50mA
- **** If not using DI for start stop function then physically short the terminal with COM.
- ***** By default, DO is configured for communicating alarm for compressor stop. It can be used for other alarms if activated in the configuration.

Connection Overview

EKE 110



Port	Description
-/~ and +/~	Power supply
	Functional Earth
+ 5 V / 18 V	Voltage for pressure probe**
+ 5 V / 18 V	Not used
Ext-GND	Not used
GND	Ground / Comm for I/O signals
DO	Digital Output
PeA	Pressure signal for economizer
S2A	Temperature signal for economizer
DI1*	Digital Input
DGT	Signal for Discharge gas temperature
BAT- and BAT+	Battery backup inputs (EKE 2U)
Valve A	Connection for injection valve
MODBUS (B-, A+, GND)	Modbus RS485 port

Note:

* DI is software configurable, if not used with external signal then short circuit it or configure it as not used in software

** By default the power supply for pressure transmitter is set for 0V. Supply will change to 5V if pressure transmitter is selected as ratiometric and 18V if selected as current type. Supply can be changed manual by selecting it in parameter P014 in advanced I/O configuration

Note:

To avoid potential malfunctions or damage to the EKE 110, connect all peripheral components only to the designated ports. Connecting components to unassigned ports may lead to operational issues.

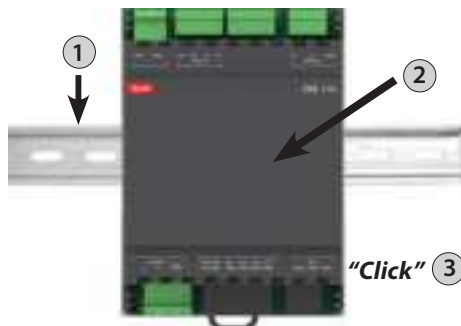
Dimensions



Mounting/Demounting

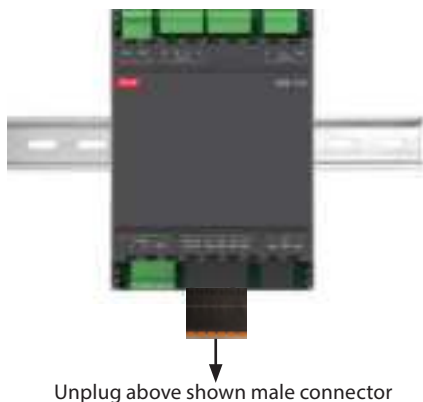
The unit can be mounted onto a 35 mm DIN rail simply by snapping it into place and securing it with a stopper located in the base of the housing.

Mounting :

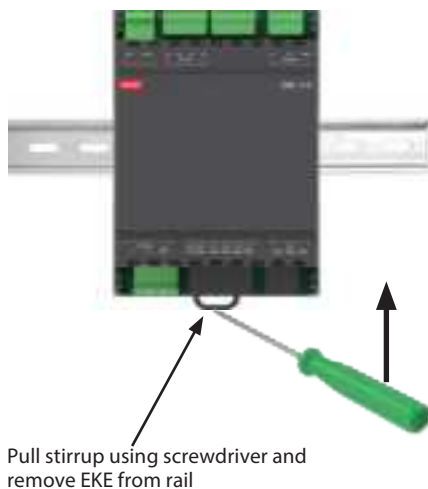


Demounting :

Step 1:

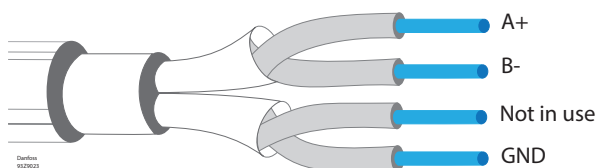


Step 2:



Modbus installation

- For the Modbus cable, it is best to use 24 AWG shielded twisted-pair cable with a shunt capacitance of 16 pF/ft and 100Ω impedance.
- The controller provides an insulated RS485 communication interface which is connected to the RS485 terminals (see connection overview).
- The max. permissible number of devices simultaneously connected to RS485 cable output is 32.
- The RS485 cable is of impedance 120 Ω with maximum length of 1000 m.
- Terminal resistors 120 Ω for terminal devices are recommended at both ends.
- The EKE communication frequency (baud rate) can be one of the following: 9600, 19200 or 38400 baud, default 19200 8E1.
- The default unit address is 1.
- For detailed info on Modbus PNU, check EKE 110 manuals



Manual resetting Modbus address:

1. Ensure pressure transmitter settings is set to ratiometric type transmitter in configuration
2. Remove Supply power from EKE 110
3. Connect terminal BAT+ to +5 V / 18 V (Important to make sure step 1 is observed)
4. Connect EKE 110 to power
5. Now Modbus communication options are reset to factory default (Address 1, 19200 baud, mode 8E1)

Signal Sharing

Power and backup supply sharing

- 1 EKE 110 and 1 EKE 2U can share power supply (AC or DC)
- 2 EKE 110 and 1 EKE 2U can share power supply only with DC

Pressure transmitter sharing

- Physical sharing is not allowed.
- Modbus sharing is allowed with more than 1 controller.

Temperature sensor sharing

- Physical sharing is not allowed.
- Modbus sharing is allowed with more than 1 controller.

Cabling

Stepper valve connector	ETS/KVS/CCM/ CCMT/CTR/ CCMT L (Using Danfoss M12 Cable)	ETS 8M Bipolar	ETS 6
A1	White	Orange	Orange
A2	Black	yellow	Yellow
B1	Red	Red	Red
B2	Green	Black	Black
Not connected	-	-	Grey



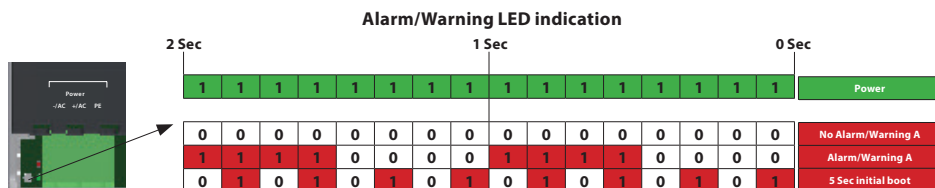
- All valves are driven in a bipolar mode with a 24 V supply chopped to control the current (Current driver).
- The stepper motor is connected to the “Stepper Valve” terminals (see terminal assignment) with a standard M12 connection cable.
- To configure stepper motor valves other than Danfoss stepper motor valves, the correct valve parameters must be set as described in the Valve configuration section by selecting user defined valve.

	Cable length	Wire size min/max (mm ²)
Power supply and Battery input	Max 5m	AWG 24-12 (0.34-2.5 mm ²) Torque (0.5-0.56 Nm)
Analog inputs	Max 10m	AWG 24-16 (0.14-1.5 mm ²)
Sensor	Max 10m	AWG 24-16 (0.14-1.5 mm ²)
Stepper valve	Max 30m	AWG 24-16 (0.14-1.5 mm ²) Torque (0.22-0.25 Nm)
Digital input	Max 10m	AWG 24-16 (0.14-1.5 mm ²)
Digital output	Max 10m	AWG 24-16 (0.14-1.5 mm ²)



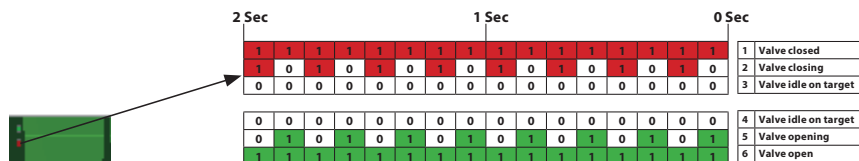
- The max. cable distance between the controller and the valve depends on many factors like shielded/unshielded cable, the wire size used in the cable, the output power for the controller and the EMC.
- Keep controller and sensor wiring well separated from mains wiring.
- Connecting sensor wires more than specified length may decrease the accuracy of measured values.
- Separate the sensor and digital input cables as much as possible(at least 10cm) from the power cables to the loads to avoid possible electromagnetic disturbances. Never lay power cables and probe cables in the same conduit (including those in electrical panels)

LED Alarm and Warning



Valve position by LED indication

Normal valve operation



Valve open circuit or valve driver heat problem

0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0

Valve type not defined

1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0
1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0

General features and warning

Plastic housing features

- DIN rail mounting complying with EN 60715
- Self-extinguishing V0 according to IEC 60695-11-10 and glowing/hot wire test at 960 °C according to IEC 60695-2-12

Other features

- To be integrated in Class I and/or II appliances
- Index of protection: IP00 or IP20 on product, depending on sales number
- Period of electric stress across insulating parts: long - Suitable for using in a normal pollution environment
- Category of resistance to heat and fire: D
- Immunity against voltage surges: category II
- Software class and structure: class A

CE Compliance

- Operating conditions CE: -20T70, 90% RH non-condensing
- Storage conditions: -30T80, 90% RH non-condensing
- Low voltage guideline: 2014/35/EU
- Electromagnetic compatibility EMC: 2014/30/EU and with the following norms:
 - EN61000-6-1, (Immunity standard for residential, commercial, and light-industrial environments)
 - EN61000-6-2, (Immunity standard for industrial environments)
 - EN61000-6-4, (emission standard for industrial environments)
 - EN60730 (Automatic electrical controls for household and similar use)

General warnings

- Every use that is not described in this manual is considered incorrect and is not authorized by the manufacturer
- Verify that the installation and operating conditions of the device respect those specified in the manual, especially concerning the supply voltage and environmental conditions
- All service and maintenance operations must therefore be performed by qualified personnel
- The device must not be used as a safety device
- Liability for injury or damage caused by the incorrect use of the device lies solely with the user

Installation warnings

- Recommended mounting position: vertical
- Installation must comply with local standards and legislation
- Before working on the electrical connections, disconnect the device from the main power supply
- Before carrying out any maintenance operations on the device, disconnect all electrical connections - For safety reasons the appliance must be fitted inside an electrical panel with no live parts accessible
- Do not expose the device to continuous water sprays or to a relative humidity greater than 90%.
- Avoid exposure to corrosive or pollutant gases, natural elements, environments where explosives or mixes of flammable gases are present, dust, strong vibrations or shock, large and rapid fluctuations in ambient temperature that might cause condensation in combination with high humidity, strong magnetic and/or radio interference (e.g., transmitting antenna)
- Use cable ends suitable for the corresponding connectors. After tightening connector screws, tug the cables gently to check their tightness - Minimize the length of probe and digital input cables as much as possible, and avoid spiral routes around power devices. Separate from inductive loads and power cables to avoid possible electromagnetic noises - Avoid touching or nearly touching the electronic components on the board to avoid electrostatic discharges
- Use appropriate data communication cables. Refer to the EKE data sheet for the kind of cable to be used and setup recommendations
- Minimize the length of probe and digital input cables as much as possible and avoid spiral routes around power devices. Separate from inductive loads and power cables to avoid possible electro magnetic noises
- Avoid touching or nearly touching the electronic components fitted on the board to avoid electrostatic discharges

Product warnings

- Use a class II power supply.
- Connecting any EKE inputs to mains voltage will permanently damage the controller.
- Battery Backup terminals does not generate power to recharge a device connected.
- Battery backup - the voltage will close the stepper motor valves if the controller loses its supply voltage.
- Do not connect an external power supply to the digital input DI terminals to avoid damaging the controller.

Danfoss Related products

Powersupply	Temperature sensor	Pressure transducer
 <p>AK-PS STEP3 ACCTRD Input: 230 V AC, 50 – 60 Hz Output: 24 V AC, available with 12 VA, 22 VA and 35 VA</p>	 <p>PT 1000 AKS is a High precision temp. sensor AKS 11 (preferred), AKS 12, AKS 21 ACCPBT PT1000</p> <p>NTC sensors EKS 221 (NTC-10 Kohm) MBT 153 ACCPBT NTC Temp probe (IP 67 /68)</p>	 <p>DST / AKS Pressure Transducer Available with ratiometric and 4 – 20 mA.</p> <p>NSK Ratiometric pressure probe</p> <p>XSK Pressure probe 4 – 20 mA</p>
Stepper motor valves	M12 cable	Backup power module
 <p>EKE is compatible with Danfoss stepper motor valves i.e Danfoss ETS 6, ETS, KVS, ETS Colibri®, KVS colibri®, CTR, CCMT, ETS 8M, CCMT L, ETS L</p>	 <p>M12 Angle cable to connect Danfoss stepper motor valve and EKE controller</p>	 <p>EKE 2U energy storage device for emergency valve shutdown during power outage.</p>
EKA 200 Koolkey	EKE 100 service cable	
 <p>EKA 200 is used as a service/copy key for EKE 100 controller</p>	 <p>EKE 100 service cable is used to connect EKE 100 / 110 controller to EKA 200 Koolkey</p>	

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