



EKD 316

Controller for evaporators in water chillers and rooftop air conditioning units

The EKD 316 controller for electronic expansion valves can operate as a standalone controller or as interface (driver) between a central system and an electronic expansion valve.

The EKD 316 controller is compatible with all Danfoss ETS and KVS valves. It is designed specifically for evaporator control in water chillers and rooftop units. Only parameters needed for those applications are shown in the menus.

Once the parameters are set with an EKA 164A Universal Setting Module, they can be read via the EKA 164A or via Modbus communication protocol.

EKD 316 Controller

Advantages

Refrigerant delivery to the evaporator is optimal—even under wide variations in load and suction pressure

Energy savings - adaptive regulation of refrigerant injection ensures that evaporator utilization is optimally efficient. Superheat is maintained at the lowest level consistent with efficient operation. Thus, suction pressure can be higher. The result is less compressor run time and lower operating and maintenance costs.

- Compatible with all Danfoss ETS and KVS stepper motor valves
- 24 Volt a.c or d.c.
- Quick, easy plug-in connectors
- Modbus communication
- Can be remote from valve
- Mounts on DIN rail
- Standalone or slave using any standard voltage or current analog signal
- Battery backup terminals
- Ratiometric pressure transmitter input connection
- User programmable for any of 31 common refrigerants

Functions

- Superheat control
- MOP function
- ON-OFF input allows manual valve closing
- Valve opening degree can be manually set
- User programmable alarm output
- Single or double loop (using extra sensor) PI regulation
- Bipolar constant current stepper motor driver

Technical data

Supply voltage	24 V a.c. +/-15% 50/60 Hz, 10 VA (supply voltage galvanically isolated from input and output signals)	
Power consumption	Controller	5 VA
	ETS step motor	1.3 VA
Input signal	Current	4-20 mA or 0-20 mA
	Voltage	0-10 V or 1-5 V
	Digital input from external contact function	
Digital (on-off) input	1 for switched valve shutdown	
Analog sensor inputs	2 for Pt1000 temperature sensors	
	1 for AKS 32R pressure transmitter	
Alarm relay	1 pcs. SPDT	AC-1: 4 A (ohmic)
		AC-15: 3 A (inductive)
Step motor output	30 mA - 300 mA, pulse modulated	
Data communication	MODBUS	
Environments	0 to 131°F (0 to +55°C), during operations	
	-40 to 158°F (-40 to +70°C), during transport	
	20 - 80% Rh, not condensing	
	Shockproof, vibration- proof	
Enclosure	IP 20	
Weight	0.6 lb (300 g)	
Mounting	DIN rail	
Operation	External display type EKA 164A	
Approvals	EU Low Voltage Directive and EMC demands re CE-marking complied with.	
	LVD-tested acc. to EN 60730-1 and EN 60730-2-9	
	EMC-tested acc. to EN50081-1 and EN 50082-2	
Battery backup	18 V dc min. 100 mAh required	
Max. distance between controller and valve	16.4 ft (5 m)	

Valve operation

ETS valves are modulated by an electronically controlled 2-phase bipolar stepper motor (AST). The stepper stays in position unless power pulses from a driver initiate one of the two discrete sets of motor windings that operate respectively in the opening and closing directions.

The direction of motor rotation depends on the phase relationship of the power pulses. The distance traveled depends on the number of pulses transmitted for a given move.

The motor drives a lead screw, whose rotating motion is transformed into linear motion by a transmission in the cage assembly.

The AST motor housing has a glass sealed 6.5 feet (2 m) cable connection as standard. Cable length and connections can be customized.

The valve cone is an exponential V-port design that provides best part load efficiency with zero-resistance maximum capacity

The cage and orifice design is fully power balanced, so that bi-flow operation has equal performance and capacity in either direction.

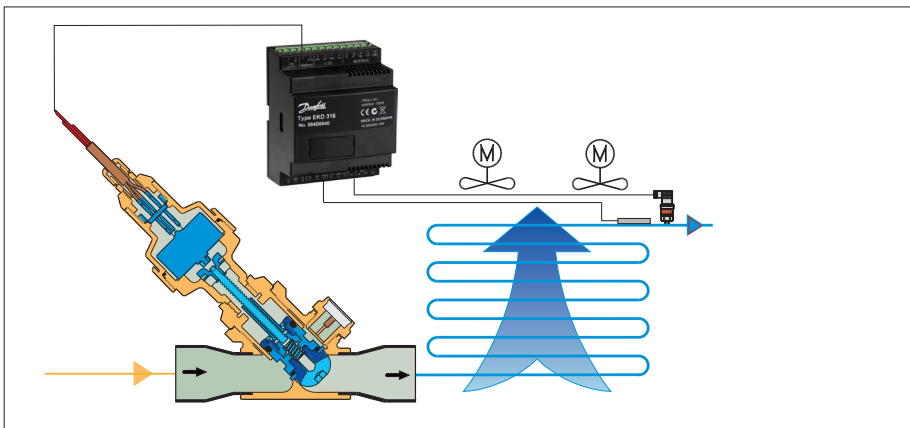
The port design includes a shut-off function with "solenoid tightness" in both flow directions. Closed position is also the mechanical stop acting as reference point to reset the controller. The zero reference point is reset at each closing, with accuracy ensured by a slight overdrive.

Electrical data

Parameter	ETS 50-400
Stepper motor type	Bi-polar
Step mode	2 phase full step
Phase resistance	52Ω ±10%
Phase inductance	85 mH
Holding current	Depends on application. Full current allowed (100% duty cycle)
Step angle	7.5° (motor), 0.9° (lead screw), Gearing ratio 8.5:1. (38/13) ² :1
Nominal voltage	(Constant voltage drive) 12 V dc - 4% +15%, 150 steps/sec.
Phase current	(Using chopper drive) 100 mA RMS - 4% +15%
Maximum total power	Voltage / current drive: 5.5 / 1.3 W (UL: NEC class 2)
Step rate	150 steps/sec. (constant voltage drive) 0-300 steps/sec. 300 recommended (chopper current drive)
Total steps	ETS 50: 2625 [+160 / -0] steps ETS 100: 3530 [+160 / -0] steps ETS 250 and 400: 3810 [+160 / -0] steps
Full travel time	ETS 50: 17 / 8.5 sec. (voltage / current) ETS 100: 23 / 11.5 sec. (voltage / current) ETS 250 and 400: 25.4 / 12.7 sec. (voltage / current)
Lifting height	ETS 50: 0.5 in. (13 mm) ETS 100: 0.6 in. (16 mm) ETS 250-400: 0.7 in. (17.2 mm)
Reference position	Overdriving against the full close position
Electrical connection	4 wire 0.02 in ² (0.5 mm ²), 6.5 ft (2 m) long cable

Stepper motor switch

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



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