Data sheet

Superheat controller

EKE 315

It is a dedicated evaporator controller for industrial refrigeration applications

Description

EKE 315 Superheat Controller can operate both Puls Width Modulated Valves and Motorized valves. A Remote display can be connected. Data communication via ModBus RTU, RS485 is included.

Features & benefits

- Depending on selection of control functionality and valves, a number of IO's can be defined, which can be used to start/stop functions from external controllers (PLC's) or used to get controller or valve/actuator status
- Main switch by DI. Start and stop regulating using signal from digital input
- Min Cooling OD to turn On the Cooling Status (Digital Output and info on screen)
- Cooling on/off by digital Input
- Feedback from ICAD of ICM valve in Liquid feed line
- Extra temperature sensor
  - Reserves an analog input for an extra temperature sensor, which can be read from Modbus
- Extra pressure sensor
  - Reserves an analog input for an extra pressure transmitter, which can be read from Modbus
- Safety stop and alarm by digital input

Ordering

Product code numbers

Display	Supply voltage	Code number
Yes	24 V DC or AC	**080G5042**

Accessories code numbers

Type	Code number
Remote display (HMI), type MMIGRS2	**080G0294** **Note:** The remote display cannot be used with Russian, Chinese, Korean or Japanese languages.
Cable between remote display and controller	**080G0075** = 1.5 m **080G0076** = 3 m

Overview

Product portfolio

Use CoolConfig for easy configuration of EKE 315:

https://coolconfig.danfoss.com

Functions

Technical data

Power supply

EKE has galvanic isolation by switch-mode power supply.
24 V AC ± 20 %, 50/60 Hz. Maximum power consumption: 15 VA/10 W.
Input voltage rating (DC): 24 V DC ± 20%, 15 W.

I/O	Type	Number	Specification
Analog Inputs	Voltage	2	**AI3, AI4** 0 – 5 V, 0 – 5 V ratiometric, 0 – 10 V, 1 – 5 V
	Current		**AI3, AI4** 0 – 20 mA, 4 – 20 mA
	NTC	3	**AI1, AI2, AI5** NTC temperature probes, 10 kΩ at 25 °C
	Pt 1000		**AI1, AI2** Accuracy: ≤ 0.5 K Resolution: 0.1 K. Range: 723 Ω to 1684 Ω
	Auxiliary Supplies	1	**5 V +** Sensor supply: 5 V DC / 50 mA, overload protection approximately 150 mA
		1	**15 V +** Sensor supply: 15 V DC / 30 mA, overload protection approximately 200 mA
		1	**24 V +** Sensor supply: 15 V DC / 30 mA, overload protection approximately 200 mA
Digital Inputs	Voltage free contacts	2	**DI1, DI2** Steady current minimum 1mA Cleaning current 100mA at 15 V DC On: RIL < = 300 Ω Off: RIH > = 3.5 k Ω

Digital Output	Solid state relay	1	**NO4** I max: 3A 24V AC/DC
	Relay	3	**C1-NO1, C2-NO2, C3NO3** **Normally Open:** 3 A GP*, 2.2 FLA / 13.2 LRA, PD 220 VA, 250 V AC 100 k 3 FLA / 18 LRA, PD 150 VA, 125 V AC 100 k **Normally Closed:** 3 A GP*, 250 V AC 100 k (*GP = General purpose) Max 240 V AC or 24 V AC / DC can be used, but same voltage type must be used on DO3 and DO2
Analog Output	Current Output	1	0 – 20 mA or 4 – 20 mA Max. load: 500 ohm
Environments			-20 °C – 55 °C, during operation -30 °C – 80 °C, during storage 90% Rh, not condensed No shock influence / vibrations
Enclosure			IP20 / IP40 for the front mounted into a panel
Weight			193 g
Mounting			DIN rail
Display			Graphical LCD display
Terminals			plugs 1.5 or 2.5 mm2 multicore
Communication	RS-485 RTU	1	**RS485** Galvanic isolation No Built-in termination
	CAN	1	**CAN - RJ** RJ connector to directly connect and supply a MMI

Operation

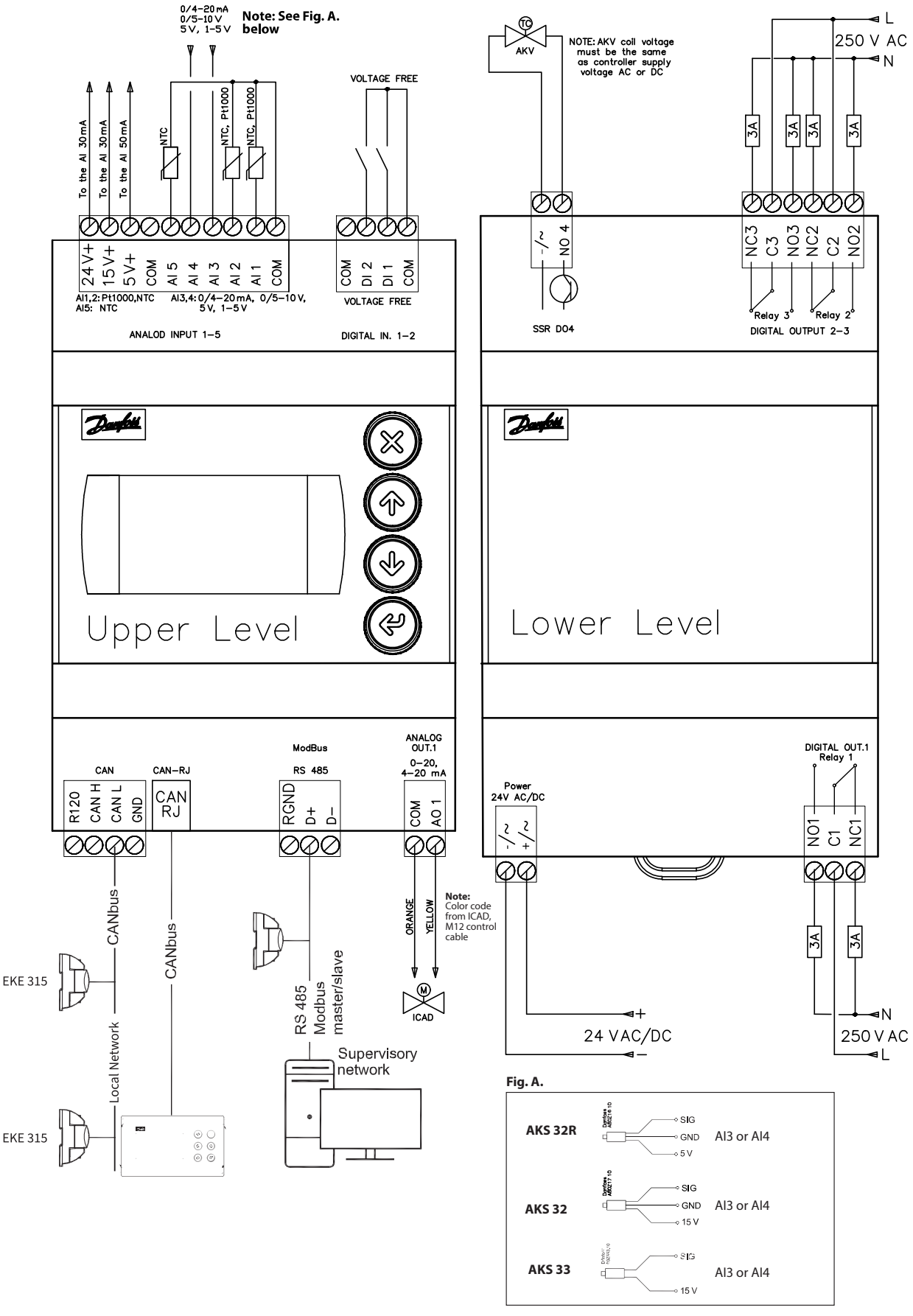


Fig. A.

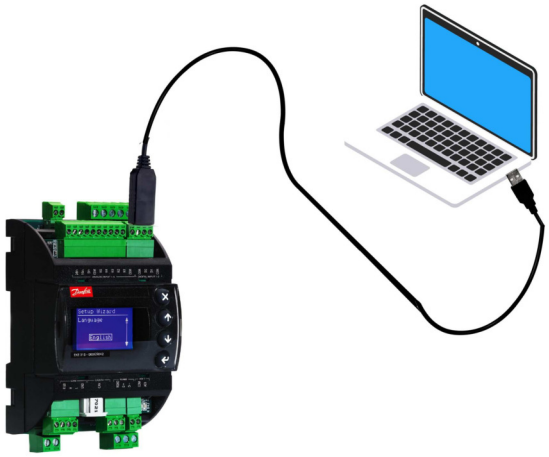
Product details

General data

Connecting CoolConfig to the EKE 315

To be able to connect CoolConfig to the controller, you will need to connect a USB port of your PC to the controller using a "Modbus to USB" cable. Most of the available "Modbus to USB" cables will do just fine.

Figure: Connecting a PC with CoolConfig to EKE 315 using a USB to Modbus cable



Before connecting the controller to CoolConfig, you will need to start up the EKE 315 controller and possibly assign a Modbus address. As default, the controller has address 1, but if you are configuring more than one controller on the Modbus network, you need to assign the different controller addresses using the display of the controller (note that CoolConfig supports easy configuration of multiple controllers in a network).

To change to controller Modbus address, do the following:

1. Power up controller and enter password:
   - A. Press a key on the controller
   - B. Press and hold the Enter key until the password screen appears
   - C. Enter password using arrow keys (move to next digit by pressing Enter) and finish pressing Enter. Default passwords:
     - I. 100 Password level 1. Read only access
     - II. 200 Password level 2. For installer for adjusting parameters
     - III. 300 Password level 3. For system configuration
2. Set Modbus address:
   - A. Enter level 3 password
   - B. Go to "System | Network" menu
   - C. Select "Modbus address" and set the wanted Modbus address of the controller

You are ready to use CoolConfig to configure the controller – or controllers – when you connect the controller to your PC's USB port using a "Modbus to USB" cable.

Controller software update

If CoolConfig is connected to a controller and the PC running CoolConfig is connected to the internet, CoolConfig will automatically check if the connected controller has the latest device software installed.

If a new device software is found, then CoolConfig will display a message that a new device software is found, and is ready for installation. The installation process will take a few minutes, and the controller will restart one or more times depending on the update.

Figure: New device software check in CoolConfig

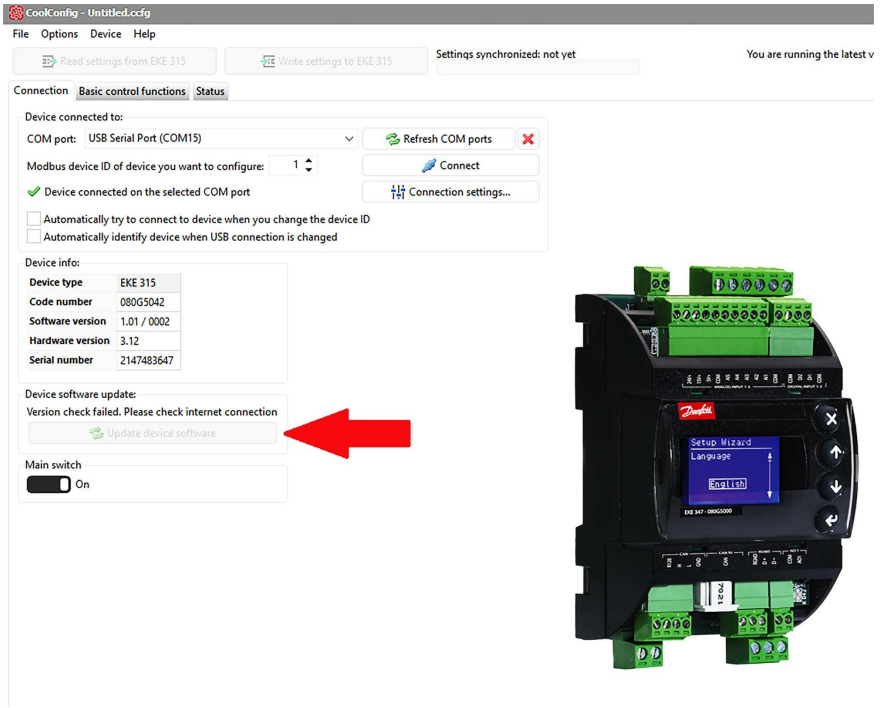
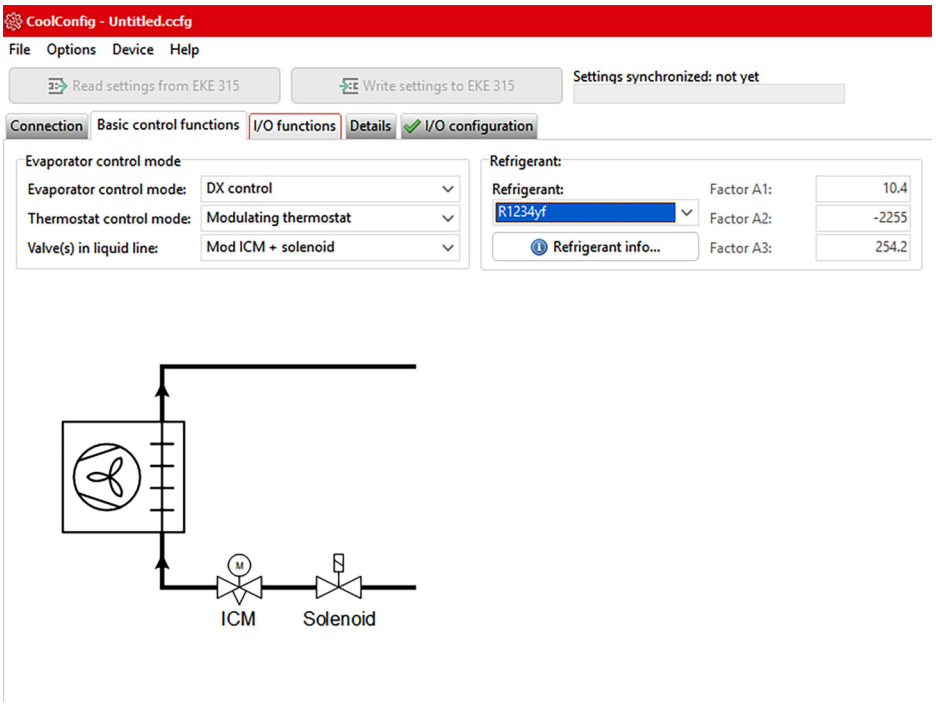


Figure: Basic control Functions



NOTE:

It is strongly recommended to save the controller setup before updating the device software! Do this by reading the controller setup using CoolConfig and save it to a file before updating the device software.

It is strongly recommended to remove CANbus and Modbus connection to other controllers while updating.

When setting up a new controller, always check if there is a new controller software available.

Connecting controllers in Modbus network

Connecting multiple controllers in a Modbus network is essentially just connecting the individual controllers with a suitable cable while observing some basic rules for handling data communication.

A description of different suitable cable types and how to use them to connect controllers can be found in the Danfoss Data communication design guide.

Data communication design guide

Po-optimization

If you connect the EKE 315 to a Danfoss system manager, you are able to do Po-optimization, i.e. raising the evaporation pressure depending on the load on the evaporators in a system (requires that a thermostat function is defined in the EKE 315). See the Danfoss System Manager documentation for more information.

Figure 4. Danfoss System Manager

Main functionalities

Parameters for selecting basic control functions

Label	Name	Description	Details
M01	Main switch	Control On/Off switch	The controller does not start controlling until Main switch is set On, and moreover a lot of the parameters in the EKE 315 requires Main switch to be Off before they can be changed – this means that these parameters require you to stop controlling before they can be changed. If Main switch is On and there is a power failure, the Main switch will On when power returns (but the same procedure as switching Main switch Off/On will be run).
Evaporator control mode			
R01	Evap. Ctrl mode	Evaporator control mode	EKE 315 Select between: "Flooded evaporator On/Off control" or "DX control"
Refrigerant			
R20	Refrigerant	Refrigerant	The EKE 315 comes with an extensive list of refrigerants supported. If you cannot find the wanted refrigerant, then you can select "User defined" and enter parameters for the Antoine equation, which is used to calculated saturation temperature based on measured pressure
R23	Refrig fact. A1	User defined refrigerant. Factor A1	The factors A1, A2 and A3 are used in the Antoine equation: $ln\{p\} = A1 + \frac{A2}{A3+T}$ Note that in this equation, the pressure, *p*, is in bar and the temperature, *T*, is in °C.
R24	Refrig fact. A2	User defined refrigerant. Factor A2	
R25	Refrig fact. A3	User defined refrigerant. Factor A3	
Thermostat control			
T1 A, B, C, D, E	Ther. mode	Thermostat control mode depending on evaporator control mode	See chapter 'Thermostat on/off control" for details

Valves

The EKE 315 allows you to define the valves needed for the selected control functionality. The valve selection is important as it will define the needed analog and digital output connections between the controller and the valves/actuators. The valve, which can be selected are explained below according to the line they are located in.

Valves in liquid/liquid feed line

Label	Name	Description	Details
R2B	Liq. line valve for DX	Valve(s) in liquid line, DX control	Selected valve(s) can be: • AKV • AKV + Solenoid • Modulating ICM • Modulating ICM + solenoid DO5 and 6 (the solid-state digital outputs) can be used for connecting the valves

I/O functions

Depending on selection of control functionality and valves, a number of IO's can be defined, which can be used to start/stop functions from external controllers (PLC's) or used to get controller or valve/actuator status.

Cooling status

Label	Name	Description	Details
P03	Main switch by DI	Main switch by DI. Start and stop regulating using signal from digital input	Turn the Main switch parameter On/Off by digital input – for example from a PLC. Note that turning Main switch off, will stop controlling immediately.
T09	Cool. status DO	Actual cooling status to be read on a DO	If defined, the cooling status (on/off) will be routed to a digital output
T22	Min. Cooling OD	Min Cooling OD to turn On the Cooling Status (Digital Output and info on screen)	If application is DX, CCR or WDX then Cooling on signal is not routed to digital output until valve opening degree is higher than this value

Evaporator control

Label	Name	Description	Details
R05	Cool On/Off by DI	Cooling on/off by digital Input	Reserves a digital input for starting and stopping cooling by an external controller (for example a PLC). Note though that if signal for example is send during defrost, then the defrost will be ended safely before cooling is started
R06	Forced closing	Forced cooling stop via network	Set this parameter over Modbus (or on controller) to stop cooling. The parameter will automatically be reset. If set On, the parameter will automatically go back to Off after 15 minutes
R08	Forced close by DI	Forced cooling stop by digital Input	Will reserve a digital input, which – when enabled – will force cooling to stop
R07	Forced cooling	Forced cooling start via network	Set this parameter over Modbus (or on controller) to start cooling. The parameter will automatically be reset. Note though that if signal for example is send during defrost, then the defrost will be ended safely before cooling is started. If set On, the parameter will automatically go back to Off after 15 minutes
R09	Forced cool by DI	Forced cooling start by digital Input	Will reserve a digital input, which – when enabled – will force cooling to start. Note though that if signal for example is send during defrost, then the defrost will be ended safely before cooling is started

Valve status

Label	Name	Description	Details
R10	LL valve AI feedback	Feedback from ICAD of ICM valve in Liquid feed line	Will reserve 1 analog input for feedback signal – the actual opening degree in pct – from ICAD. Signal can be used to check if requested opening degree is the same as actual opening degree

Additional AI's

Label	Name	Description	Details
SS1	Temperature sensor	Extra temperature sensor	Reserves an analog input for an extra temperature sensor, which can be read from Modbus
SP1	Pressure sensor	Extra pressure sensor	Reserves an analog input for an extra pressure transmitter, which can be read from Modbus

Safety stop

Label	Name	Description	Details
A71	Safety stop by DI	Safety stop and alarm by digital input	If selected a digital input will be reserved for a safety stop signal. If the safety stop is enabled, the following will happen: • Liquid/liquid feed line valves will be closed • Hot gas valves will be closed • Drip tray valve will be closed • Quick drain valve will be closed • Drain valve will be closed • An alarm will be raised Note that the state is persistent (i.e., stored in controller even if power goes off)
S70	Manual alarm reset	Require manual reset of safety stop alarm	If set, it will always require a manual reset of the alarm in the controller

Thermostat control

The EKE 315 includes three different methods for controlling air temperature:

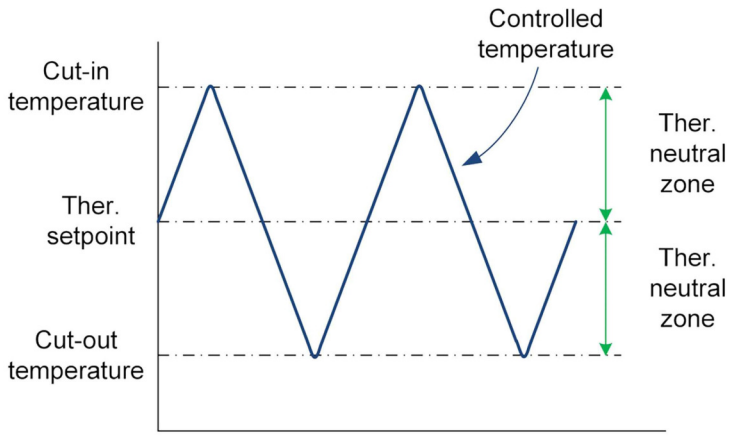
1. On/off thermostat control
2. Modulating thermostat control

For details on PWM liquid control and modulating thermostat see chapters *"Direct expansion evaporator control mode"*.

Thermostat On/Off control

Thermostat On/Off control is normally used to control a solenoid valve in the liquid line to start/stop flow of refrigerant to the evaporator depending on an air temperature setpoint and a neutral zone:

Figure: Thermostat On/Off control



The EKE 315 supports two types of On/Off thermostat modes:

1. **Individual On/Off**. In this mode each controller has its own thermostat settings, and each controller works independently of other controllers
2. **Common On/Off**. In this mode the thermostat is controlled by the primary controller in a controller group. When the main controller switch On or Off, all other controllers in that group will switch On or Off. See chapter *"Controller coordination"* on how to define controller groups and which controller will be primary in a group

The following parameters are used to define an On/Off thermostat:

Label	Name	Description	Details
T04	Ther. setpoint	Thermostat setpoint	The setpoint in °C or °F for the air temperature
T05	Ther. neutral zone	Thermostat neutral zone	Neutral zone temperature difference in K or °F. Actual cut-in = setpoint + neutral zone. Actual cut-out = setpoint - neutral zone
T02	No. of ther. sensor	Number of thermostat sensors	Up to three sensors are supported
T03	Ctrl temp. method	Calculation of control temperature for thermostat	Only available if more than one sensor is selected. You can then select if the control temperature should be the average of all sensors or the maximum value

If needed, you can define a night-setback temperature difference of the thermostat setpoint (note that similar functionality can be defined using the External reference functionality – see chapter *"External reference"*).

Night setback parameters:

Label	Name	Description	Details
T06	Day/night control	Allow manual (or via network) control of Day/Night	Set this parameter to allow for day/night control
T07	Night operation	Night operation	Set this parameter to true to start night mode. Set it to false to end night mode. Setting the parameter can be done manually in the display, via Modbus or using CoolConfig
T08	Night offset	Night offset	The offset (temperature difference) to add to the thermostat setpoint when in night mode

Air temperature alarm function

A temperature alarm can be setup for the measured air temperature. The following parameters are available:

Label	Name	Description	Details
B01	Air temp. alarm	Air temperature alarm function	Select between: "None", "Separate sensor", "Thermostat temp" Note that if "Thermostat temp" is selected (default), then an analog input for will be reserved for a temperature sensor – even if thermostat control is set to "None". If separate sensor is selected, another analog input will be reserved for an air temperature sensor.
B02	High alarm limit	Upper alarm limit for the room temperature alarm function	
B03	Low alarm limit	Lower alarm limit for the room temperature alarm function	
B04	Alarm delay	Alarm delay time during normal control used for both high- and low temperature alarms	Alarm delay in minutes

Product temperature alarm function

A temperature alarm can be setup for a separate product temperature sensor. The following parameters are available:

Label	Name	Description	Details
B05	Product alarm function	Product temperature alarm	If "Yes", then a product temperature sensor needs to be connected to an analog input
B06	Prod. high alarm limit	Upper alarm limit for the product temperature alarm	
B07	Prod. low alarm limit	Lower alarm limit for the product temperature alarm	
B08	Prod. alarm delay	Alarm delay time for the product temperature alarm	Alarm delay in minutes

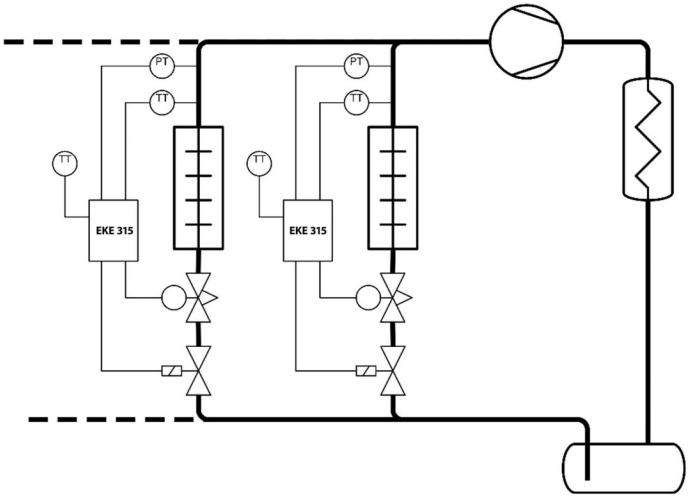
Thermostat IO definition

IO	Type	Description	Details
Ther. air	AI	Air temperature sensor	Can be positioned on any of the 8 analog inputs. This parameter will be visible if at least one temperature sensor has been selected or if the room temperature alarm function (B01) refers to "Thermostat temperature"
Ther. air 2	AI	Air temperature sensor	Available if 2 temperature sensors are selected (see parameter T02)
Ther. air 3	AI	Air temperature sensor	Available if 3 temperature sensors are selected (see parameter T02)
Air temp. alarm	AI	Air temperature alarm sensor	Available if parameter B01 (see above) is set to "Separate sensor"
Product temp.	AI	Product temperature alarm sensor	Available if parameter B05 is "Yes"

Direct expansion evaporator control mode

In direct expansion (DX) evaporator control mode, the EKE 315 can control injection valve according to a superheat signal:

Figure: Direct expansion system with superheat control and On/Off thermostat



Modulating Thermostat (DX systems only)

In modulating thermostat mode, the injection to the evaporator is controlled so that the air temperature is kept close to a given setpoint. If the measured superheat gets below a threshold value, the controller automatically switch to superheat control, and when possible, the controller switch back to modulating thermostat control.

Important: Modulating thermostat is not recommended on systems with one evaporator.

When using modulating thermostat, the evaporator will in part load situations be starved – i.e., the amount of gas in the evaporator outlet will be high and the load on the evaporator will not be evenly distributed. But compared to On/Off thermostat, the evaporator will still be running, and the temperature control will be more precise.

Due to the uneven load on the evaporator in part load situations, using modulating thermostat on low temperature applications is generally not recommended. The uneven load distribution will typically lead to uneven frost formation, which can make defrosting difficult.

Parameters specific to modulating thermostat:

Label	Name	Description	Details
Advanced parameters			
N15	MTR Tn	Integration time for the MTR algorithm	Integration time of the PI controller used to control the expansion valve according to room temperature
N16	MTR Kp	Proportional gain for the MTR algorithm	Proportional gain of the PI controller used to control the expansion valve according to room temperature

The parameters for On/Off thermostat (including night setback) will also be available if modulating thermostat is selected, but the thermostat setpoint and the neutral zone will be used to control the opening of the expansion valve.

Superheat control
The superheat control algorithm in the EKE 315 is a PI controller with advanced adjustments that will assist in controlling evaporators in DX refrigeration systems in a stable manner.

The superheat control algorithm has a dedicated startup control mode, which is used to fill the evaporator efficiently after for example a thermostat cut-out.

After the startup mode, the EKE 315 supports the following methods for setting the reference for the superheat control algorithm:

1. Fixed superheat reference
2. Load defined control
3. Adaptive superheat control

The startup mode and the 3 different superheat reference modes are explained in detail below, but there are a couple of common parameters when using superheat control:

Label	Name	Description	Details
N09	SH close function	Superheat close function	Close the expansion valve completely if superheat gets below a given value
N10	SH close setpoint	Superheat close limit. The valve is forced to close	The minimum superheat when expansion valve is closed in N09 is true. below this superheat value
N11	SH close Tn divide	Division factor on integration time for PI controller closing valve at low superheat (increase value to decrease integration time and close valve faster)	If N09 is selected, then a separate and more aggressive PI controller (based on the standard superheat PI controller) is used when the superheat is close to the value specified in N10. The N11 and N12 parameters are used to modify the integration time and gain inherited from the standard PI controller so that the "superheat close PI controller" becomes more aggressive (reacts faster) than the standard PI controller.
N12	SH close Kp factor	Factor on proportional gain for PI controller closing valve at low superheat (increase value to increase gain and close valve faster)	
Maximum operating pressure limit			
N13	MOP function	Maximum Operating Pressure	If selected, then the valve will start to close if the evaporation pressure is above the defined setpoint. MOP is typically used to prevent overloading the compressor motor during startup.
N14	MOP setpoint	Maximum Operating Pressure setpoint	Setpoint for the MOP function
N26	MOP Kp	MOP Kp	Proportional gain of controller when managing MOP
N27	MOP Tn	MOP Tn	Integration time of controller when managing MOP
Expansion valve settings			
N17	AKV period	AKV or AKVA period is seconds	The period for a pulse width modulated expansion valve. Within this period, the valve both opens and closes. 40% opening degree for example means that the valve is open 40 % of the period time and closed the rest
N24	Minimum OD	Minimum Opening Degree	Minimum opening degree of the expansion valve. Default is 0 %, but this can be changed if needed
N25	Maximum OD	Maximum Opening Degree	Maximum opening degree of the expansion valve. Default is 100 %, but this can be changed if needed. Can be used to limit the opening degree of an oversized expansion valve

The PI controller controlling the superheat according to the selected reference mode has the following parameters:

Label	Name	Description	Details
N05	SH Tn	Superheat controller integration time	Superheat controller integration time. If the integration time is increased the regulation becomes slower. Lowering the integration time will create a faster superheat control. Too low value will create superheat fluctuation
N06	SH Kp damp	Damping of gain near superheat setpoint	Damping of gain when superheat is near the wanted reference value. This setting damps the normal gain (N07, SH Kp), but only just around the reference value. A setting of 0.5 will reduce the gain to half of the defined value in N07
N07	SH Kp	Superheat controller proportional gain	Superheat controller proportional gain. If the gain is reduced the regulation becomes slower. If the gain is increased the regulation becomes faster. Too high value will create superheat fluctuation
N08	SH KpTe	Suction pressure feedback gain	Suction pressure (temperature) feedback gain to the PI controller

Startup mode
Startup mode allows the controller to open the expansion valve faster at startup – for example after a thermostat cut-in, a finished defrost or when Main switch is turned On. This can be useful if the compressor pulls down the suction pressure faster than desired at startup (especially relevant in systems with few evaporators).

The startup mode parameter has the following options:

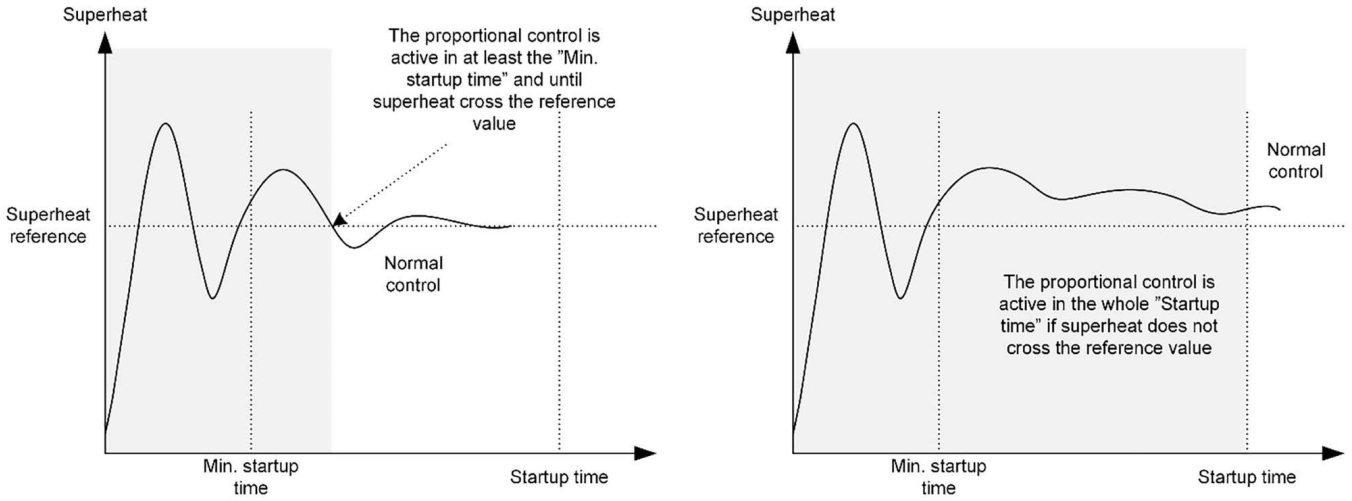
Label	Name	Description	Details
N20	Startup mode	Startup mode	Can be: Proportional control Fixed OD with protection Fixed OD without protection The different modes are explained below

Proportional control
The proportional control function can be used to quickly get close to the system's superheat reference. The controller is programmed for auto-proportional control that will quickly change the opening degree based on evaporating temperature and the superheat of the system.

Parameters for proportional control:

Label	Name	Description	Details
N23	Startup OD	Startup opening degree	Initial opening degree of the expansion valve
N21	Startup time	Startup time	Maximum time to use in startup mode
N22	Min. startup time	Minimum startup time	Minimum amount of time controller at least must spend in startup mode

Figure: Proportional startup mode. Illustration of startup time settings

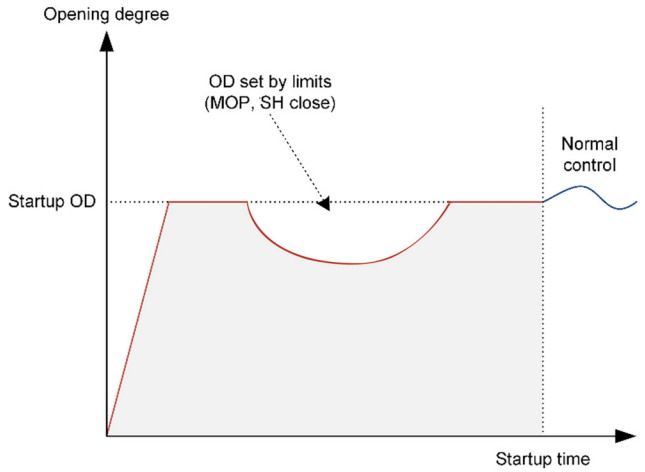


Fixed opening degree with and without protection

After startup (for example after cut-in of the thermostat), this function will provide an initial opening degree during a defined period.

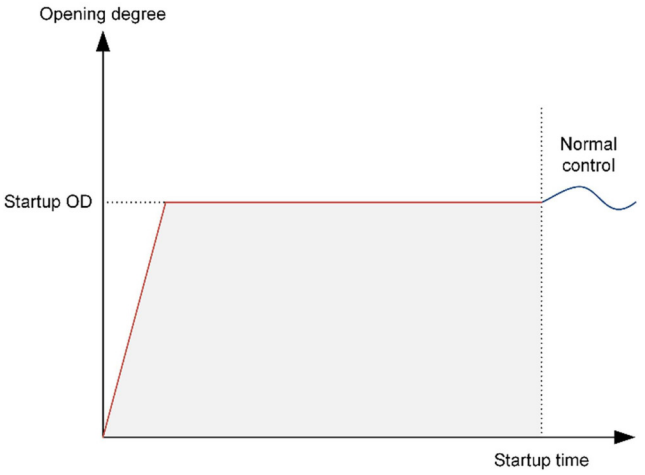
If "fixed opening degree with protection" is defined and any of the superheat control limits (MOP, SH close function) are defined, then the controller will set the opening degree of the valve based on the fixed opening degree value and the set limits, where the limits will override the fixed opening degree:

Figure: Fixed opening degree startup mode with protection



If "fixed opening degree without protection" is defined, then the specified valve opening degree will be set regardless of any limits:

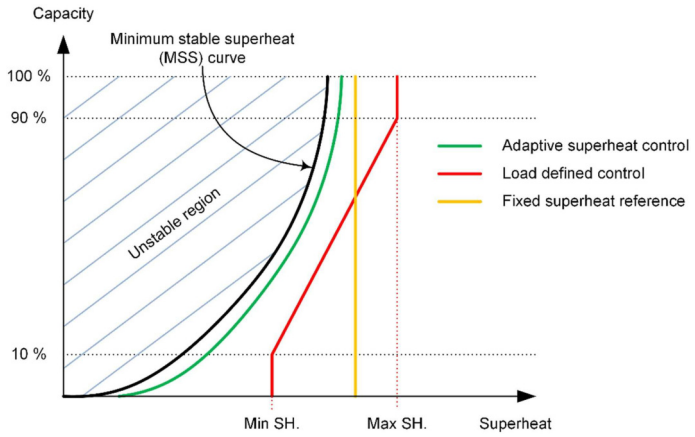
Figure: Fixed opening degree startup mode without protection



Label	Name	Description	Details
N23	Startup OD	Startup opening degree	The fixed opening degree to use during startup
N21	Startup time	Startup time	Maximum time to use in startup mode

Superheat reference mode
The three different superheat reference modes are illustrated below:

Figure: Superheat reference modes



Selection of the wanted reference mode is done using the parameter:

Label	Name	Description	Details
N01	SH ref. mode	Superheat reference mode	This parameter is used to select which of the 3 reference modes you want to use

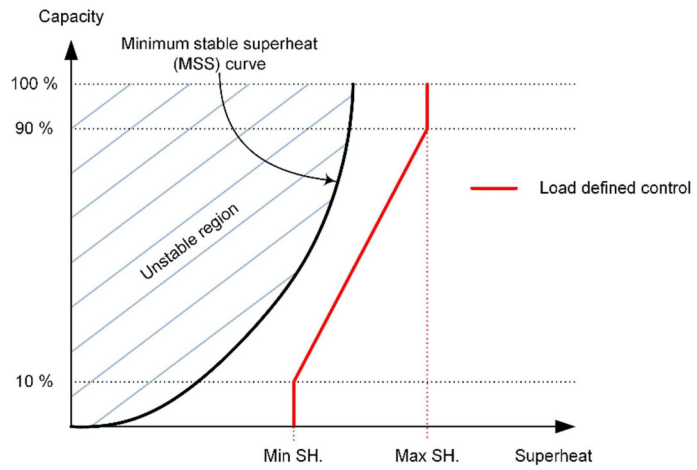
Fixed superheat reference
The "Fixed superheat reference" mode will just keep a preset and fixed reference for the superheat control. The fixed superheat control can be used in systems with stable operating conditions.

The superheat setpoint is defined using the parameter:

Label	Name	Description	Details
N02	SH Fixed setpoint	Superheat fixed setpoint	Fixed setpoint for the superheat control if "Fixed superheat reference" method is used

Load defined control
The "Load defined control" will adjust the superheat reference to be higher if the load is higher. The load is indicated by the opening degree of the expansion valve.

Figure: Load defined control of superheat reference



"Load defined control" can be seen as a preprogrammed MSS curve, defined by the minimum superheat, the maximum superheat, and 90 % opening degree, and 10% opening degree of the expansion valve as illustrated in Figure *Load defined control of superheat reference*.

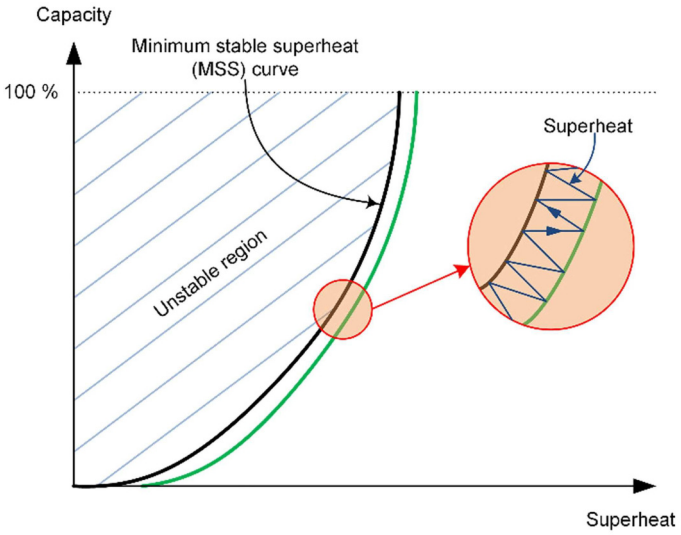
"Load defined control" will give a robust superheat reference and can in many cases be the best fit for a given system.

The parameters used to setup "Load defined control" are:

Label	Name	Description	Details
N03	SH max	Superheat maximum	Maximum allowed superheat setpoint
N04	SH min	Superheat minimum	Minimum allowed superheat setpoint

Adaptive superheat control

The "adaptive superheat control" will continuously try to optimize the superheat reference so that the system always will run with the minimum possible superheat. Figure *Adaptive superheat control* shows an illustration of the principle:



"Adaptive superheat control" is a benefit for systems with a long runtime and slow changing conditions like cold rooms, display cases and chillers. Short cycling times and system with fast changing operation condition will not benefit from "adaptive superheat control" as this feature will take time to find the optimal reference. Adaption to a new set point is approximately 15 minutes.

The "Adaptive superheat control" is configured by the following parameters:

Label	Name	Description	Details
N03	SH max	Superheat maximum	Maximum allowed superheat setpoint. Used to limit the setpoint found by adaptive algorithm
N04	SH min	Superheat minimum	Minimum allowed superheat setpoint. Used to limit the setpoint found by adaptive algorithm
N18	MSS stability	Minimum Stable Superheat stability	Stability factor for regulation of superheat. With a higher value the control function will allow a greater fluctuation of the superheat before the reference is changed

N19	MSS T0 stability factor	Minimum Stable Superheat stability T0 factor	Evaporation temperature stability factor. Defines if a variation in suction pressure will influence the superheat reference or if the reference is only influenced by variation in suction temperature, S2. The evaporation temperature stability factor can be adjusted between 0 and 1: 0 = Superheat reference only influenced by S2 temperature 1 = Maximum evaporation temperature, T0, influence. In systems with frequent changes in suction pressure due to compressor start/stop, some T0 (and S2) influence on MSS stability is recommended. Default value is 0

Controller coordination

If several controllers are connected on the CAN bus, then these controllers can share functionality, such as:

- Common thermostat (see chapter External reference)
- Common pressure transmitter
- NeoCharge and defrost coordination

A CAN bus network can consist of maximum 120 controllers. These 120 controllers can be divided into groups, and within each group, functionality can be shared.

The way to divide the controllers into groups, is to specify the number of groups (on each controller in the network). If the number of groups are set to for example 10, then there will be maximum 120 / 10 = 12 controllers in each group. (note that there does not need to be 12 controllers in each group – there can be less).

The controllers are placed in groups by the controller address (which equals the Modbus address). If there is for example 10 groups, then the controllers will be grouped like this:

Group	Modbus addresses
Group 1	1, 2, 3, …12
Group 2	13, 14, 15, … 24
Group 3	25, 26, 27, … 36
…	…
Group 10	109, 110, 111, … 120

If for example 9 groups are defined, then each group will have maximum 13 controllers – except the last group, which will maximum have the remaining number of controllers (which in the case of 9 groups will leave 120 – 8*13 = 16 controllers for the last group).

Whitin each group, the controller with the first address will be designated the "default main controller". If for some reason the main controller changes state– for example when the controller enters defrost – the "main controller" shifts to the next controller in the group (which is not in the defrost state). When the default main controller is bac to normal state, it will automatically again be the "main controller".

It is the main controller's responsibility to coordinate the different functionalities that are defined.

The following parameters defines the functions to be coordinated between controllers in a group:

Label	Name	Description	Details
G17	Number of groups	Number of controller groups	See description above
Sensor sharing			
R11	Com. press transmitter	Common pressure transmitter	Select between: "No" , "Sharing on CAN-bus", "Receiving from CAN bus". If "Sharing on CAN-bus" is selected, then the pressure transmitter connected to this controller will be shared on the CAN bus. If "Receiving from CAN bus" is selected, the no pressure transmitter is connected to this controller, and it is relying on the shared pressure received from the CAN bus (will be communicated by the main controller). If more controllers are sharing a transmitter, then the main controller will calculate the average value, and if one transmitter fails, the system will continue to run using the remaining transmitters (and raise an alarm on the controller where the transmitter failed)
G18	CAN Bus sharing min. update interval	Minimum update interval for sharing values on CAN bus	Minimum update interval for sharing sensor values. Default 10 s. If this interval is exceeded, a bus sharing timeout alarm is raised

External reference

The EKE 315 allows the following setpoints to be displaced by an external signal:

- Superheat setpoint – when running in DX control mode
- Thermostat setpoint – when a thermostat control function is defined, or when evaporation pressure control by room temperature is enabled
- Evaporation pressure setpoint – when evaporation pressure control by pressure is enabled

The setpoint can be displaced by:

- A current analog input
- A voltage analog input
- A Modbus input
- A digital input

If an analog input is used to displace the setpoint, the following values needs to be defined:

- Max value of offset (corresponding to max value of analog input)
- Min value of offset (corresponding to min value of analog input)
- Max value of analog input
- Min value of analog input

If a Modbus input is used, then the offset is just written to a Modbus address.

If a digital input is used, then the offset is 0 when the DI is closed and the offset for when the DI is open must be defined. The following parameters are used to define the functions:

Superheat setpoint:

Label	Name	Description
N28	Ext.Ref.DX config	Offset of superheat setpoint by external signal
N29	Ref.Offset SH Max	Offset of setpoint, max value
N30	Ref.Offset SH Min	Offset of setpoint, min value
N31	Ref.Current SH High	AI signal range - high value
N32	Ref.Current SH Low	AI signal range - low value
N33	Ref.Voltage SH High	AI signal range - high value
N34	Ref.Voltage SH Low	AI signal range - low value
N35	Re.Offset SH Modbus	Offset value via network
N38	Ref. Offset SH by DI	Offset value when DI is open, 0 K if closed

Thermostat setpoint:

Label	Name	Description
P10	Ext ref. config.	Offset of thermostat setpoint by external signal
P11	Ref. offset max	Offset of setpoint - max value
P12	Ref. offset min	Offset of setpoint - min value
P13	Ref. current high	AI signal range - high value
P14	Ref. current low	AI signal range - low value
P15	Ref. voltage high	AI signal range - high value
P16	Ref. voltage low	AI signal range - low value
P18	Ref. offset by Modbus	Offset value via network
P19	Ref. offset by DI	Offset value when DI is open, 0 K if closed
P17	Lowpass bandwidth	Lowpass bandwidth of lowpass filter applied to analog input signal

Emergency cooling

If a sensor error occurs, the EKE 315 can enter an emergency cooling mode, where the injection valve and/or the evaporation pressure control valve is put in a fixed position.

The parameters that are used to set up emergency cooling are:

Label	Name	Description	Details
P20	Ther. sensor error	Thermostat temperature sensor error	Select either: "Close valve", "Fixed OD" or "Use average OD". When "Close valve" is selected, all valves in the liquid/liquid feed line (injection and/or solenoid valves). The OD is referring to the opening degree of the injection valve. The average OD is a moving average of the opening degree of the valve from the last 5 minutes
P22	Fixed OD emer. cool	Fixed valve OD at emergency cooling	If "Fixed OD" is selected in P20, then this will define the opening degree
P21	SH sensor error	S2 or Pe sensor error	Select either: "Close valve", "Fixed OD" or "Use average OD". When "Close valve" is selected, the injection valve in the liquid/liquid feed line will be closed (any solenoid in the liquid/liquid feed line will not be closed). The OD is referring to the opening degree of the injection valve. The average OD is a moving average of the opening degree of the valve from the last 5 minutes
P2A	Fixed OD emer. cool	Fixed valve OD at emergency cooling	If "Fixed OD" is selected in P21, then this will define the opening degree

Alarm settings

The EKE 315 defines several alarms depending on the selected controller functionality.
Each alarm can be given one of the following priorities:

- Disable (alarm is ignored)
- Normal
- Severe
- Critical

The EKE 315 does not automatically stop controlling or take other actions depending on the alarm severity, except that there is a possibility to:

- Define that a certain priority (and higher priorities) will activate a digital output
- Define that a certain priority (and higher priorities) will activate the build in buzzer

The alarm priority settings are defined by the following parameters:

Label	Name	Description
P02	Alarm output DO	Alarm priority that will activate a digital output
cAB	Buzzer Management	Alarm priority that will activate the buzzer

The alarms, which can be given a priority, are listed below.
Evaporator control

Label	Name	Description
A48	Pressure sens. error	Pressure transmitter error
A76	S2 temp. error	S2 temperature sensor error

Thermostat control

Label	Name	Description
A50	Ther. air sensor error	Thermostat temperature sensor error
A51	Ther. air 2 sensor error	Thermostat temperature sensor 2 error
A53	Air alarm sensor error	Air alarm sensor error
A61	High temp. alarm	The room temperature is too high
A62	Low temp. alarm	The room temperature is too low
A55	Product sensor error	Product temperature sensor error
A63	High product temp. alarm	The product temperature is too high
A64	Low product temp. alarm	The product temperature is too low

I/O functions

Label	Name	Description
A59	Standby mode	Control is stopped by internal or external Main Switch (DI input)
A66	Output in MAN mode	An output is set in manual mode
A68	Safety stop alarm	Safety stop alarm

External reference

Label	Name	Description
A49	Ext. Ref. error	External reference for thermostat setpoint error
A79	Ext. Ref.SH error	External reference input for superheat setpoint error
A90	Ext. Ref.T0 error	External reference input for T0 setpoint error

Valves

Label	Name	Description
A83	LL valve DI alarm	Liquid line valve alarm by DI
A86	LL valve AI alarm	LL line ICAD input error (out of scale)

Controller coordination

Label	Name	Description
A94	Bus share timeout error	Timeout error sharing pressure transmitter

System settings

The system settings menu contains parameters for changing language, units, passwords etc.:

Label	Name	Description	Details
Display			
G01	Language	Set the system language	Select between: English, French, Italian, German, Dutch, Japanese, Portuguese, Spanish, Russian, Chinese and Korean
P01	Temperature units	Temperature unit	Select between °C and °F. Note that if °C is selected, pressure will be in bar, and if °F is selected, pressure will be in psi
G03	Screen saver time	Screen saver time	Minutes before display is dimmed
G04	User logout time	User logout time	Minutes before user is logged out
G05	Display contrast	Display contrast	
Password			
G07	Password level 1	Password level 1.	Daily tasks. Read only access. Default 100
G08	Password level 2	Password level 2.	Service task. For adjusting parameters. Default 200
G09	Password level 3	Password level 3.	Commissioning task. For configuration of system. Default 300
Network			
G11	Modbus address	Modbus address of controller	Set Modbus address between 1 and 120.
G12	Baud rate	Baud rate (default 38400)	Select between: 0 = 0 bps 12 = 1200 bps 24 = 2400 bps 48 = 4800 bps 96 = 9600 bps 144 = 14400 bps 192 = 19200 bps 288 = 28800 bps 384 = 38400 bps
G13	Serial mode	Serial Modbus mode	Select between: 8E1 = 8 bit, Even parity, 1 stop bit 8N1 = 8 bit, No parity, 1 stop bit 8N2 = 8 bit, No parity, 2 stop bits
Reset			
G14	Reset to factory	Reset all to factory settings. Alarm list will also be cleared	

Modbus parameter overview

The following tables give an overview of all the Modbus parameters in an EKE 315.

The columns have the following meaning:

Column	Meaning
Label	The label of the parameter. Short name used to uniquely define a parameter. Can be used to search for a specific parameter in CoolConfig
Name	Short name of the parameter as seen in the display of the controller
Description	Long description of the parameter. Also including a description of the different integer values the parameter can take if it is an enumerated parameter (see for example parameter "S1A, Control state" below)
Min	Minimum value the parameter can take
Max	Maximum value the parameter can take
Factory setting	Default value
Unit	Unit (if any)
Decimals	Number of decimals the parameter has. A Modbus value is read as a Word value, so if a value of 568 is read and number of decimals is 2, then the value is 5.68
Locked by main switch	If true then this parameter can only be changed when Main switch is off – i.e., this parameter cannot be changed when the controller is in control mode
Read only	If true then value of the parameter can only be read – if false, the value can also be changed by writing a new value to the Modbus address
Password level Read – Write	Password level needed to read or write a parameter. Note that CoolConfig always require password level 3 to change parameters
Persistent	If true then the value is saved even if power to controller is switched off
Modbus PLC address	The 1-based Modbus address of the parameter

Control status readouts
This group of parameters contain status variables that can be read on the controller display.

LABEL	Name	Description	MIN	MAX	Factory setting	UNIT	RW	Modbus PLC address
PARAMETERS & STATUS VARIABLES								
SRT	**Main Menu > Start / Stop**							
M01	Main switch	Start and stop controlling	0	1	0 - Off		RW	3001
M02	Ext. Main switch	Status of the external main switch (DI)	0	1	0 - Off		Read	3002
BSC	**Main Menu > Basic control**							
R01	Evap. ctrl mode	-1 - None 2 - DX control	-1	2	-1 - None		RW	3033
T1B	Ther. mode	0 - None 1 - _Individual_On_Off 2 - Common_On_Off 4 - MTR	0	4	1 - _Individual_On_Off		RW	3034
R2B	Liq. line valve	4 - AKV 5 - AKV___solenoid 6 - Mod_ICM 7 - Mod_ICM___solenoid	4	7	4 - AKV		RW	3035
BS3	**Main Menu > Refrigerant**							
R20	Refrigerant	0 - Undef; 1 - R12; 6 - R13 7 - R13b1; 2 - R22; 8 - R23 14 - R32; 11 - R114; 3 - R134a 12 - R142b; 24 - R170; 15 - R227 25 - R290; 16 - R401A; 18 - R402A 19 - R404A; 21 - R407A; 22 - R407B 20 - R407C; 37 - R407F; 49 - R407H 23 - R410A; 32 - R413A 30 - R417A; 31 - R422A 33 - R422D; 34 - R427A 35 - R438A; 40 - R448A 41 - R449A; 48 - R449B 43 - R450A; 42 - R452A 44 - R452B; 45 - R454B 9 - R500; 4 - R502; 10 - R503 17 - R507; 36 - R513A; 26 - R600 27 - R600a; 5 - R717; 28 - R744 46 - R1233zdE; 39 - R1234yf 38 - R1234ze; 47 - R1234zeZ 29 - R1270; 13 - R_user	0	49	0 - Undef		RW	3036
R23	Refrig. fact. A1	User defined refrigerant. Factor A1	8.000	13.000	10.400		RW	3037
R24	Refrig. fact. A2	User defined refrigerant. Factor A2	-3200.0	-1200.0	-2255.0		RW	3038
R25	Refrig. fact. A3	User defined refrigerant. Factor A3	220.0	320.0	254.2		RW	3039
S01	**I/O functions > Cooling status**							
P03	Main switch by DI	0 - No 1 - Yes	0	1	0 - No		RW	3040
T09	Cool. status DO	0 - No 1 - Yes	0	1	0 - No		RW	3041
T22	Min.Cooling OD		0	20	5	%	RW	3042
S03	**I/O functions > Evaporator ctrl**							
R05	Cool On/Off by DI	0 - No 1 - Yes	0	1	0 - No		RW	3043
R06	Forced closing	0 - Off 1 - On 2 - On	0	2	0 - Off		RW	3044

R07	Forced cooling	0 - Off 1 - On 2 - On	0	2	0 - Off		RW	3045
R08	Forced close by DI	0 - No 1 - Yes	0	1	0 - No		RW	3046
R09	Forced cool by DI	0 - No 1 - Yes	0	1	0 - No		RW	3047
S05	**I/O functions > Valve status**							
R10	LL valve AI feedback	0 - No 1 - Yes	0	1	0 - No		RW	3048
A80	LL valve DI alarm	0 - No 1 - Yes	0	1	0 - No		RW	3205
S06	**I/O functions > Additional AI's**							
SS1	Temperature sensor	0 - No 1 - Yes	0	1	0 - No		RW	3049
SP1	Pressure sensor	0 - No 1 - Yes	0	1	0 - No		RW	3050
S08	**I/O functions > Safety stop**							
A71	Safety stop by DI	0 - No 1 - Yes	0	1	0 - No		RW	3052
S70	Manual alarm reset	0 - No 1 - Yes	0	1	0 - No		RW	3053
EC1	**Evaporator ctrl > Superheat ctrl.**							
N01	SH ref. mode	0 - Fixed SH ref. 1 - Load defined 2 - Adaptive SH	0	2	2 - Adaptive SH		RW	3060
N02	SH fixed setpoint	Superheat fixed setpoint	0.5	40.0	8.0	K	RW	3061
N03	SH max	Superheat maximum	N04	40.0	10.0	K	RW	3062
N04	SH min	Superheat minimum	0.5	N03	4.0	K	RW	3063
N09	SH close function	0 - No 1 - Yes	0	1	1 - Yes		RW	3064
N10	SH close setpoint	Superheat close limit. The valve is forced to close below this superheat value	-5.0	20.0	2.0	K	RW	3065
EC2	**Evaporator ctrl > Startup SH ctrl**							
N20	Startup mode	0 - Prop__Ctrl 1 - Fix_OD_w_prot 2 - Fix_OD_wo_prot	0	2	0 - Prop__Ctrl		RW	3066
N21	Startup time	Startup time	1	600	90	sec	RW	3067
N22	Min. startup time	Min. startup time	1	240	15	sec	RW	3068
N23	Startup OD	Startup Opening Degree	1	100	32	%	RW	3069
EC3	**Evaporator ctrl > Expansion vlv**							
N17	AKV period	AKV or AKVA period time	3	6	6	sec	RW	3070
N24	Minimum OD	Minimum Opening Degree	0	N25	0	%	RW	3071
N25	Maximum OD	Maximum Opening Degree	N24	100	100	%	RW	3072
EC4	**Evaporator ctrl > MOP**							
N13	MOP function	0 - No 1 - Yes	0	1	0 - No		RW	3073
N14	MOP setpoint	Maximum Operating Pressure setpoint	-70.0	60.0	0.0	°C	RW	3074
EC5	**Evaporator ctrl > Superheat adv.**							
N05	SH Tn	Superheat controller integration time	20	900	600	sec	RW	3075
N07	SH Kp	Superheat controller proportional gain	0.1	20.0	1.5		RW	3076
N08	SH KpTe	Suction pressure feedback gain	0.0	20.0	3.0		RW	3077

N06	SH Kp damp	Damping of gain near superheat setpoint	0.1	1.0	0.6		RW	3078
N11	SH close Tn divide	Division factor on integration time for PI controller closing valve at low superheat (increase value to decrease integration time and close valve faster)	1	5	3		RW	3079
N12	SH close Kp factor	Factor on proportional gain for PI controller closing valve at low superheat (increase value to increase gain and close valve faster)	0.5	10.0	1.5		RW	3080
EC6	**Evaporator ctrl > MSS advanced**							
N18	MSS Stability	Minimum Stable Superheat stability	0.0	10.0	5.0		RW	3081
N19	MSS T0 stability factor	Minimum Stable Superheat stability T0 factor	0.0	1.0	0.0		RW	3082
EC7	**Evaporator ctrl > MOP advanced**							
N26	MOP Kp	MOP Kp	1.0	20.0	5.0		RW	3083
N27	MOP Tn	MOP Tn	20	900	45	sec	RW	3084
N37	Tn SH tracking		3	600	200	sec	RW	3085
THF	**Thermostat ctrl > Thermostat ctrl**							
T04	Ther. setpoint	Thermostat set point temperature	-70.0	160.0	2.0	°C	RW	3088
T05	Ther. neutral zone	Thermostat neutral zone (+ - to setpoint)	0.1	20.0	2.0	K	RW	3089
T02	No. of media sensor		0	2	1		RW	3086
T03	Ctrl temp. method	0 - Max temp ctrl 1 - Avg temp ctrl	0	1	0 - Max temp ctrl		RW	3087
TC4	**Thermostat ctrl > Day/night ctrl**							
T06	Day/night control	0 - No 1 - Yes	0	1	0 - No		RW	3090
T07	Night operation	0 - No 1 - Yes	0	1	0 - No		RW	3091
T08	Night offset	Offset of the thermostat set point temperature during night operation	-20.0	20.0	-2.0	K	RW	3092
TC6	**Thermostat ctrl > Modulating ther.**							
N15	MTR Tn	Advanced parameter. Integration time for the MTR algorithm	20	3600	600	sec	RW	3094
N16	MTR Kp	Advanced parameter. Proportional gain for the MTR algorithm	0.2	20.0	3.0		RW	3095
N39	MTR with cutout	0 - No 1 - Yes	0	1	1 - Yes		RW	3096
ATA	**Thermostat ctrl > Air temp. alarm**							
B01	Air temp. alarm	0 - None 1 - Separate_sensor 2 - Use_ther__temp_	0	2	0 - None		RW	3097
B02	High alarm limit	Upper alarm limit for the room temperature alarm function	-100.0	200.0	6.0	°C	RW	3098
B03	Low alarm limit	Lower alarm limit for the room temperature alarm function	-100.0	200.0	-30.0	°C	RW	3099
B04	Alarm delay	Alarm delay time during normal control used for both high- and low temperature alarms	0	240	120	min	RW	3100
PTA	**Thermostat ctrl > Product tmp al.**							
B05	Prod.alarm function	0 - No 1 - Yes	0	1	0 - No		RW	3101
B06	Prod. high al. limit	Upper alarm limit for the product temperature alarm	-100.0	200.0	6.0	°C	RW	3102

B07	Prod. low al. limit	Lower alarm limit for the product temperature alarm	-100.0	200.0	-30.0	°C	RW	3103
B08	Prod. alarm delay	Alarm delay time for the product temperature alarm	0	240	120	min	RW	3104
C01	**Coord. ctrl. > Ctrl. groups**							
G17	Number of groups	Number of evaporator groups. There are 120 CAN-bus addresses, so if there is 10 groups, there is maximum 12 controllers in each group	1	60	4		RW	3120
C02	**Coord. ctrl. > Sensor sharing**							
R11	Com. press transmitter	0 - No 1 - Sharing_on_bus 2 - Receiving_from_bus	0	2	0 - No		RW	3121
G18	CAN Bus sharing min. update interval	Min update interval for sharing values on CAN bus	5	60	10	sec	RW	3122
EX1	**Ext. references > SH setpoint**							
N28	Ext.Ref.DX config	0 - Not_used 1 - Displace_by_current 2 - Displace_by_voltage 4 - Displace_by_DI 3 - Displace_by_modbus	0	4	0 - Not_used		RW	3130
N29	Ref.Offset SH Max	Offset of setpoint, max value	0.0	50.0	0.0	K	RW	3131
N30	Ref.Offset SH Min	Offset of setpoint, min value	-70.0	0.0	0.0	K	RW	3132
N31	Ref.Current SH High	AI signal range - high value	N32	20.0	20.0	mA	RW	3133
N32	Ref.Current SH Low	AI signal range - low value	0.0	N31	4.0	mA	RW	3134
N33	Ref.Voltage SH High	AI signal range - high value	N34	10.0	10.0	V	RW	3135
N34	Ref.Voltage SH Low	AI signal range - low value	0.0	N33	0.0	V	RW	3136
N35	Ref.Offset SH Modbus	Offset value send via network	-70.0	50.0	0.0	K	RW	3137
N38	Ref.Offset SH by DI	Offset value when DI is open, 0 K if closed	-70.0	50.0	0.0	K	RW	3138
EX2	**Ext. references > Ther. setpoint**							
P10	Ext. ref. config.	0 - Not_used 1 - Displace_by_current 2 - Displace_by_voltage 4 - Displace_by_DI 3 - Displace_by_modbus	0	4	0 - Not_used		RW	3139
P11	Ref. offset max	Offset of setpoint - max value	0.0	160.0	0.0	K	RW	3140
P12	Ref. offset min	Offset of setpoint - min value	-70.0	0.0	0.0	K	RW	3141
P13	Ref. current high	AI signal range - high value	P14	20.0	20.0	mA	RW	3142
P14	Ref. current low	AI signal range - low value	0.0	P13	4.0	mA	RW	3143
P15	Ref. voltage high	AI signal range - high value	P16	10.0	10.0	V	RW	3144
P16	Ref. voltage low	AI signal range - low value	0.0	P15	0.0	V	RW	3145
P18	Ref. offset by Modbus	Offset value send via network	-70.0	160.0	0.0	K	RW	3146
P19	Ref.offset by DI	Offset value when DI is open, 0 K if closed	-70.0	160.0	0.0	K	RW	3147
EX4	**Ext. references > AI filter**							
P17	Lowpass bandwidth	0 - None 1 - 4 Hz 2 - 2 Hz 3 - 1 Hz 4 - 0.5 Hz 5 - 0.2 Hz	0	5	5 - 0.2 Hz		RW	3148
EMC	**Main Menu > Emergency cool.**							
P20	Ther. sensor error	0 - Stop_cooling 1 - Fixed_OD 2 - Use_average_OD	0	2	0 - Stop_cooling		RW	3150
P22	Fixed OD emer. cool	Fixed valve OD at emergency cooling	0	100	0	%	RW	3151

P21	SH sensor error	0 - Stop_cooling 1 - Fixed_OD 2 - Use_average_OD	0	2	0 - Stop_cooling		RW	3152
P2A	Fixed OD emer. cool	Fixed valve OD at emergency cooling	0	100	0	%	RW	3153
AL1	**Alarm setting > Alarm priority**							
P02	Alarm output DO	0 - No relay 1 - Critical alarms 2 - Severe alarms 3 - All alarm	0	3	0 - No relay		RW	3180
AL2	**Alarm setting > Evaporator ctrl.**							
A48	Pressure sens.error	0 - Critical 1 - Severe 2 - Normal 3 - Disable	0	3	2 - Normal		RW	3183
A76	S2 temp error		0	3	2 - Normal		RW	3184
A78	High pressure MOP		0	3	2 - Normal		RW	3186
AL4	**Alarm setting > Thermostat ctrl.**							
A50	Media sensor err.	0 - Critical 1 - Severe 2 - Normal 3 - Disable	0	3	2 - Normal		RW	3187
A51	Media 2 sens.err.		0	3	2 - Normal		RW	3188
A53	Air alarm sens.err.		0	3	2 - Normal		RW	3190
A61	High temp. alarm		0	3	0 - Critical		RW	3191
A62	Low temp. alarm		0	3	0 - Critical		RW	3192
A55	Product sensor error		0	3	2 - Normal		RW	3193
A63	High prod.temp.alarm		0	3	1 - Severe		RW	3194
A64	Low prod. temp.alarm		0	3	1 - Severe		RW	3195
AL6	**Alarm setting > I/O functions**							
A67	IO config. error	0 - Critical 1 - Severe 2 - Normal 3 - Disable	0	100	0		RW	3196
A59	Standby mode		0	3	2 - Normal		RW	3198
A66	Output in MAN mode		0	3	2 - Normal		RW	3199
A68	Safety stop alarm		0	3	0 - Critical		RW	3200
AL6	**Alarm setting > External ref.**							
A49	Ext.Ref.Ther error	0 - Critical 1 - Severe 2 - Normal 3 - Disable	0	3	2 - Normal		RW	3201
A79	Ext.Ref.SH error		0	3	2 - Normal		RW	3202
AL7	**Alarm setting > Valves**							
A83	LL valve DI alarm	0 - Critical 1 - Severe 2 - Normal 3 - Disable	0	3	2 - Normal		RW	3203
A86	LL valve AI alarm		0	3	2 - Normal		RW	3204
AL8	**Alarm setting > Ctrl. coord.**							
A94	Bus share timeout error	0 - Critical 1 - Severe 2 - Normal 3 - Disable	0	3	2 - Normal		RW	3206
MSC	**Main Menu > Miscellaneous**							
REC	Reset Emergency Cooling timer		0	1	0		RW	3210
DSP	**System > Display**							
G01	Language	0 - English; 3 - Italian 4 - German; 5 - French 6 - Spanish; 13 - Portuguese 16 - Dutch__Netherlands_ 9 - Russian; 14 - Chinese 17 - Japanese__Japan_ 18 - Korean__Korea_	0	18	0 - English		RW	3500
P01	Temperature units	0 - MET 1 - IMP	0	1	0 - MET		RW	3901

G03	Screen saver time	Screen saver time (minutes before display is dimmed)	1	60	2	min	RW	3222
G04	User logout time	User logout time (minutes before display is dimmed)	1	60	2	min	RW	3223
G05	Display contrast	Display contrast	0	100	40	%	RW	3224
NET	**System > Network**							
G11	Modbus address	Modbus address of controller	1	120	1		RW	3111
G12	Baudrate	0 - 0 1 - 12 2 - 24 3 - 48 4 - 96 5 - 144 6 - 192 7 - 288 8 - 384	0	8	8 - 384		RW	3112
G13	Serial mode	0 - 8N1 1 - 8E1 2 - 8N2	0	2	1 - 8E1		RW	3113
RST	**System > Reset to factory**							
G14	Reset to factory	0 - No 1 - Yes	0	1	0 - No		RW	3114
WGE	**Quick setup > General**							
LCX	Wizard lock		0	1	0		RW	3900
P01	Temperature units	0 - MET 1 - IMP	0	1	0 - MET		RW	3901
r01	Evap. ctrl mode	2 - DX control	2	2	2 - DX control		Read	3902
r20	Refrigerant	0 - Undef; 1 - R12; 6 - R13 7 - R13b1; 2 - R22; 8 - R23 14 - R32; 11 - R114; 3 - R134a 12 - R142b; 24 - R170; 15 - R227 25 - R290; 16 - R401A; 18 - R402A 19 - R404A; 21 - R407A; 22 - R407B 20 - R407C; 37 - R407F; 49 - R407H 23 - R410A; 32 - R413A 30 - R417A; 31 - R422A 33 - R422D; 34 - R427A 35 - R438A; 40 - R448A 41 - R449A; 48 - R449B 43 - R450A; 42 - R452A 44 - R452B; 45 - R454B 9 - R500; 4 - R502; 10 - R503 17 - R507; 36 - R513A; 26 - R600 27 - R600a; 5 - R717; 28 - R744 46 - R1233zdE; 39 - R1234yf 38 - R1234ze; 47 - R1234zeZ 29 - R1270; 13 - R_user	0	49	0 - Undef		RW	3907
WDM	**Quick setup > Valve settngs**							
r2B	Liq. line valve	4 - AKV 5 - AKV___solenoid 6 - Mod_ICM 7 - Mod_ICM___solenoid	4	7	4 - AKV		RW	3910
WAL	**Quick setup > Alarm setting**							
p02	Alarm output DO	0 - No_relay 1 - Critical_alarms 2 - Severe_alarms 3 - All_alarm	0	3	0 - No_relay		RW	3927
WTh	**Quick setup > Thermostat**							
t1B	Ther. mode	0 - None 1 - _Individual_On_Off 2 - Common_On_Off 4 - MTR	0	4	0 - None		RW	3904

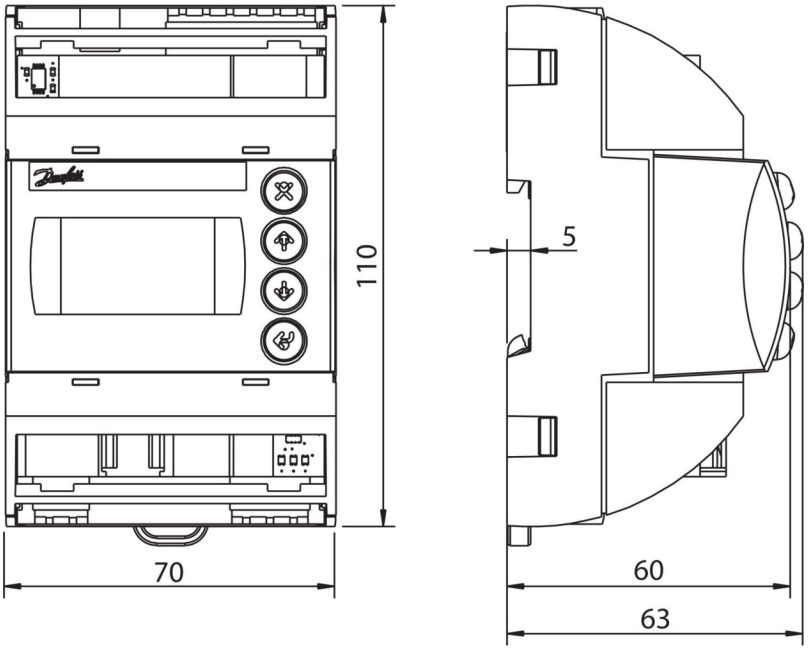
t04	Ther. setpoint	Thermostat set point temperature	-70.0	160.0	2.0	°C	RW	3911
t05	Ther. neutral zone	Thermostat neutral zone (+ - to setpoint)	0.1	20.0	2.0	K	RW	3912
WAL	**Quick setup > Air temp. alarm**							
b01	Air temp. alarm	0 - None 1 - Separate_sensor 2 - Use_ther__temp_	0	2	0 - None		RW	3918
b02	High alarm limit	Upper alarm limit for the room temperature alarm function	-100.0	200.0	6.0	°C	RW	3913
b03	Low alarm limit	Lower alarm limit for the room temperature alarm function	-100.0	200.0	-30.0	°C	RW	3914
b04	Alarm delay	Alarm delay time during normal control used for both high- and low temperature alarms	0	240	120	min	RW	3915
WMI	**Quick setup > Miscellaneous**							
p03	Main switch via DI	0 - No 1 - Yes	0	1	0 - No		RW	3916
CS3	**Status var > Control general purpose**							
S26	Emergency Control Period		0	100	0		Read	3421
S27	Emergency Control Duty		0	100	0		Read	3422
ST1	Thermostat mode		0	100	0		Read	3424
SW1	Debug Dx State		0	100	0		Read	3425
SW2	Debug Dx injDetails		0	100	0		Read	3426
SR1	Evap. ctrl mode		0	100	0		Read	3431
S01	Control state		0	0	0		Read	3403
S2A	Merge Main Switch		0	1	0		Read	3411
SR2	Liq. line valve		0	100	0		Read	3423
SC1	Commit high		0	100	0		Read	3434
SC2	Commit low		0	100	0		Read	3435
ALS	**Status var > Alarm statistics**							
PAA	Active alarms		0	1	0		Read	3433
I01	ActiveAlarmStatus		-32768	32767	0		Read	3400
I02	Number of active alarms		0	32767	0		Read	3401
LNG	**Main Menu > Select language**							
G01	Language	0 - English; 3 - Italian 4 - German; 5 - French 6 - Spanish; 13 - Portuguese 16 - Dutch__Netherlands_ 9 - Russian; 14 - Chinese 17 - Japanese__Japan_ 18 - Korean__Korea_	0	18	0 - English		RW	3500
LAN	**Quick start > Select language**							
G01	Language	0 - English ; 3 - Italian 4 - German; 5 - French 6 - Spanish; 13 - Portuguese 16 - Dutch__Netherlands_ 9 - Russian; 14 - Chinese 17 - Japanese__Japan_ 18 - Korean__Korea_	0	18	0 - English		RW	3500
SET	**Status menu > Setpoint**							
T04	Ther. setpoint	Thermostat set point temperature	-70.0	160.0	2.0	°C	RW	3088
T05	Ther. neutral zone	Thermostat neutral zone (+ - to setpoint)	0.1	20.0	2.0	K	RW	3089
N02	SH fixed setpoint	Superheat fixed setpoint	0.5	40.0	8.0	K	RW	3061
DET	**Status menu > Detailed status**							

S1A	Control states	0 - _0 1 - Main_switch_is_OFF 2 - Manual_control 3 - Pump_down 4 - HG_open_delay 5 - HG_Drip_tray 6 - HG_soft_opening 7 - Defrosting 8 - HG_close_delay 9 - Drain_close_delay 10 - Drip_off_time 11 - WR_open_delay 12 - Fan_start_delay 13 - Not_used 14 - Forced_closing 15 - Forced_cooling 16 - Emergency_control 17 - Modulating_WR 18 - MTR_control 19 - Cooling 20 - Cooling_stopped 21 - Refrig__not_sel_ 22 - Power_up_state 23 - Critical_Alarm 24 - Modulating_Pwm 25 - IO_config_error 26 - Drain_equalising 27 - Cooling_WDX 28 - Cooling_DX 29 - Cooling_CCR 30 - NeoCharge_Adjusting 31 - NeoCh__Adj__Restarting 32 - Fan_safety_alarm	0	32	0 - _0		Read	3412
S02	Cooling status	0 - Off 1 - On	0	1	0 - Off		Read	3404
S03	Media	Temperature used for the thermostat function	0.00	100.00	0.00	°C	Read	3405
S20	Injection OD	Opening degree of injection valve	0.00	100.00	0.00	%	Read	3417
S18	S2 temperature	The refrigerant temperature measured at S2 sensor position	0.00	100.00	0.00	°C	Read	3415
S17	Evap. temp Te	Actual evaporating temperature Te converted from pressure	0.00	100.00	0.00	°C	Read	3414
S21	S2 superheat	Superheat (S2 temperature - Evap. Temp. Te)	0.0	100.0	0.0	K	Read	3418
S22	SH reference	Reference used for the superheat control	0.0	100.0	0.0	K	Read	3419
S35	Ther. reference		0.00	100.00	0.00	°C	Read	3917
S05	Cut in limit	Thermostat cut in limit adjusted with night offset	0.00	100.00	0.00	°C	Read	3406
S06	Cut out limit	Thermostat cut out limit adjusted with night offset	0.00	100.00	0.00	°C	Read	3407
S04	Night status	0 - Off 1 - On	0	1	0 - Off		Read	3408
S07	Alarm air temp.	Room temperature used for alarm function	0.00	100.00	0.00	°C	Read	3409
S08	Product temp.	Measured product temperature	0.00	100.00	0.00	°C	Read	3410
S16	Evap. press Pe	Actual evaporating pressure Pe	0.00	100.00	0.00	barg	Read	3413
S34	LL valve AI Feedback	Feedback from ICAD of ICM valve in liquid line	0.00	100.00	0.00	%	Read	3428
SSt	Add. temp	Additional temperature reading	0.00	100.00	0.00	°C	Read	3429
SPp	Add. press	Additional pressure reading	0.00	200.00	0.00	barg	Read	3430
SOL	Solenoid status		0	1	0		Read	3432

ALARMS

LABEL	DESCRIPTION		MIN	MAX	RESET	IN OFF		
A01	General alarm		0	1	AUTO	INACTIVE	Read	1901 .08
E01	Ext.Ref.Ther error	External reference for thermostat setpoint error	0	1	AUTO	INACTIVE	Read	1901 .09
E02	Pressure Sensor		0	1	AUTO	INACTIVE	Read	1901 .10
A50	Media sensor	Thermostat temperature sensor error	0	1	AUTO	INACTIVE	Read	1901 .11
A51	Media-2 sensor	Thermostat temperature sensor 2 error	0	1	AUTO	INACTIVE	Read	1901 .12
A53	Air alarm sensor	Air alarm sensor error	0	1	AUTO	INACTIVE	Read	1901 .13
A55	Product sensor err.	Product temperature sensor error	0	1	AUTO	INACTIVE	Read	1901 .14
A59	Standby mode	Control is stopped by internal or external Main Switch (DI input)	0	1	AUTO	INACTIVE	Read	1901 .15
A60	Refrigerant not set	No refrigerant has been selected	0	1	AUTO	INACTIVE	Read	1901 .00
A61	High temp. alarm	The room temperature is too high	0	1	AUTO	INACTIVE	Read	1901 .01
A62	Low temp. alarm	The room temperature is too low	0	1	AUTO	INACTIVE	Read	1901 .02
A63	High product temp.	The product temperature is too high	0	1	AUTO	INACTIVE	Read	1901 .03
A64	Low product temp.	The product temperature is too low	0	1	AUTO	INACTIVE	Read	1901 .04
A66	Output in MAN mode	An output is set in manual mode	0	1	AUTO	INACTIVE	Read	1901 .05
A67	IO config. error	Not all inputs and output functions have been assigned to hardware inputs or outputs	0	1	AUTO	INACTIVE	Read	1901 .06
A68	Safety stop Alarm	Safety stop by digital input, need a manual reset to remove it	0	1	AUTO	INACTIVE	Read	1901 .07
A76	S2 temp error	S2 temperature sensor error	0	1	AUTO	INACTIVE	Read	1902 .08
A79	Ext.Ref.SH error	External reference input for superheat setpoint error	0	1	AUTO	INACTIVE	Read	1902 .10
A83	LL valve DI alarm	Liquid line valve alarm by DI	0	1	AUTO	INACTIVE	Read	1902 .11
A86	LL valve AI alarm	LL line ICAD input error (out of scale)	0	1	AUTO	INACTIVE	Read	1902 .12
A94	Shared signal timeout alarm	Timeout error sharing pressure transmitter	0	1	AUTO	INACTIVE	Read	1902 .13

Dimensions

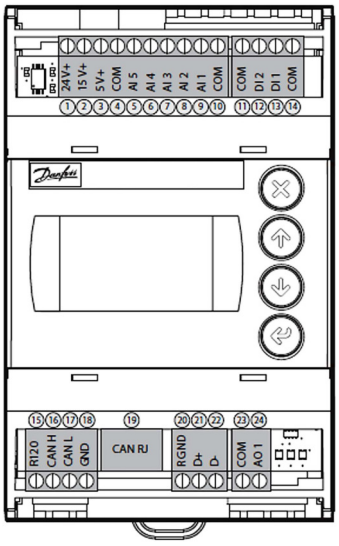


Note:
Dimensions are in mm.

Connections

Reading guideline

EKE 315 have four push bottoms to operate, navigate and enter setpoints and settings:



 > Escape or return function

 > Move 1 line up, increase value

 > Move 1 line down, decrease value

 > Acknowledge/Enter submenu or value. Long push

Very first start-up

After Power on

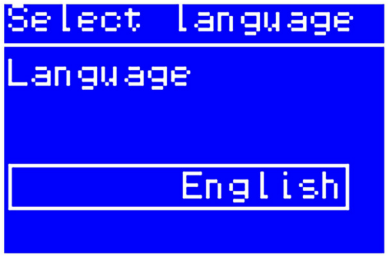
Hold <> until screen below appear

Enter Password: 300. Push <>, <>, <> and <>, <>, <> to complete

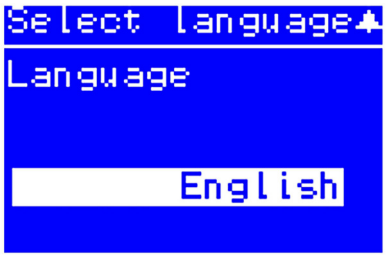
Will be displayed a few seconds and then

Push <> for "Select language"

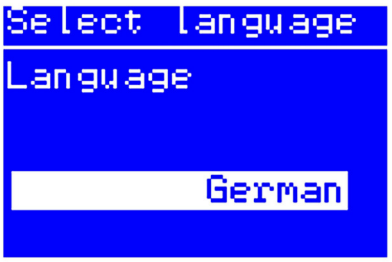
Push <> for enter menu



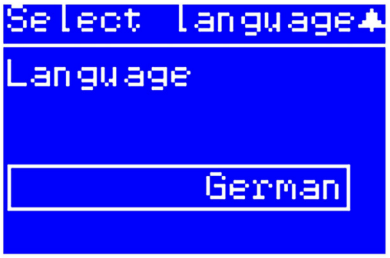
Push < > or < > to Select language



When correct language push < >



Push < > to go back



Push < > and < > to Setup wizard

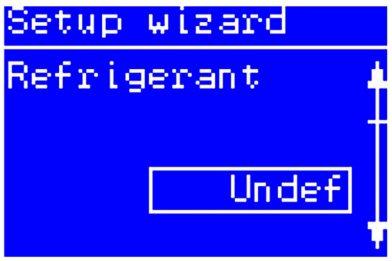
Push  >

Temperature units
Select between MET (metric) and IMP (imperial)
Note that if MET is selected, pressure will be in bar, and if IMP is selected, pressure will be in psi

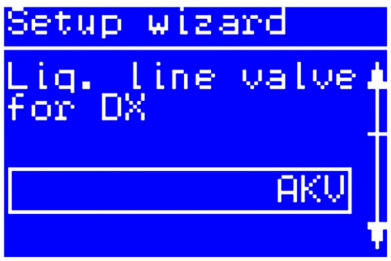
Push  >

Evap. Ctrl mode locked to DX control.
Cannot be changed

Select Ther. mode:
None: No thermostat
Individual_On_Off:
In this mode each controller has its own thermostat settings, and each controller works independently of other controllers
Common_On_Off:
In this mode the thermostat is controlled by the primary controller in a controller group. When the main controller switch On or Off, all other controllers in that group will switch On or Off
MTR:
Modulating TheRmostat. The injection to the evaporator is controlled so that the air temperature is kept close to a given setpoint



Select Refrigerant
Select the refrigerant used in question



Select Liq. line valve for DX
Select the current valve used in the Liquid line
AKV: AKV/AKVA valve
AKV + solenoid: AKV/AKVA valve and solenoid infront
Mod ICM: Modulating ICM valve
Mod_ICM_+ sol.: Modulating ICM valve and solenoid infront

Ther. setpoint
Thermostat set point temperature

Ther. Neutral zone
Thermostat neutral zone (+/- to Thermostat set point temperature)

High alarm limit
Upper alarm limit for the room temperature alarm function

Low alarm limit
Lower alarm limit for the room temperature alarm function

Alarm delay
Alarm delay time during normal control used for both high- and low temperature alarms

Main switch via DI
Start and stop regulating using signal from digital input

Setup wizard overview
Overview of available and assigned DO/DI/AO and AI

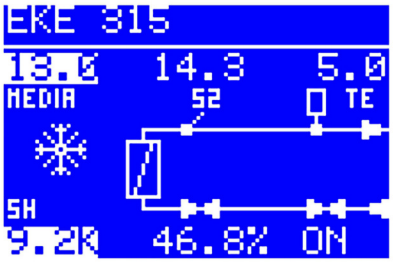
Apply wizard settings?

Push < > for No

Push < > for Yes

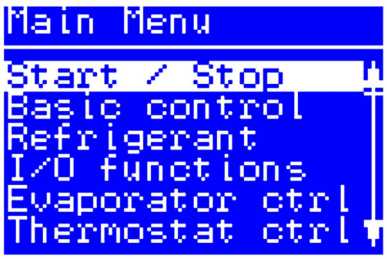
Enable EKE 315 internal Main Switch

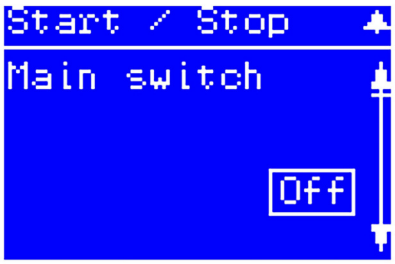
Push < > as many times until below is shown:



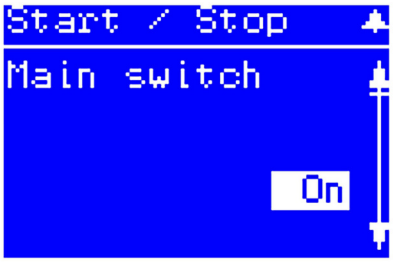
Push < > and hold until below is shown

Select **Start / Stop**

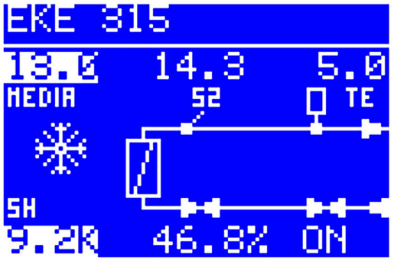




Push <> and <> and <>



Push <> until below is shown



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.

When you click on the link you will be directed to the latest version of the 'Declaration of Conformity'. Products developed and sold before this date of issue conform to the directives/standards in force at the time of their sale.

Approval type	Title	Certification body	Approval topic
Export Control Declaration	Electroni Superheat Controller	Danfoss	
EU Declaration	EU declaration 080R5350.01	Danfoss	LVD, EU RoHS, EMC

Contact details

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Danfoss offers a wide range of support along with our products, including digital information, software, mobile apps and expert guidance. See the possibilities below.

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Danfoss A/S

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