KLIC-DI VRV

KNX Interface for
Variable Refrigerant Volume A/C Units

ZN1CL-KLIC-DI

Application programme version: [1.14]
User manual edition: [1.14]_a

www.zennio.com

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1 INTRODUCTION

1.1 KLIC-DI

KLIC-DI is an interface that allows full-duplex communication between a KNX domotic system and **commercial and industrial** air-conditioning units, through two possible application programmes.

- **KLIC-DI VRV**, for industrial A/C systems with a variable refrigerant volume.

- **KLIC-DI SKY**, for other commercial A/C systems.

Because of this **bidirectional** communication, the air conditioning unit can be controlled in the same manner as through its own controls, while the real status of the air-conditioning unit is monitored and periodically sent to the KNX bus to inform other devices.

KLIC-DI includes the following features, among others:

- Bidirectional control over industrial and commercial A/C units.

- Control of the main features of the A/C units: On/Off, Temperature, Mode of operation, Fan speed, Swing, etc.

- Error management to handle specific A/C unit error codes as well as any communication errors that may arise.

- LED indicator that allows monitoring the bidirectional traffic flow.

1.2 INSTALLATION

1.- KNX connector

2.- LED indicator

3.- Programming button

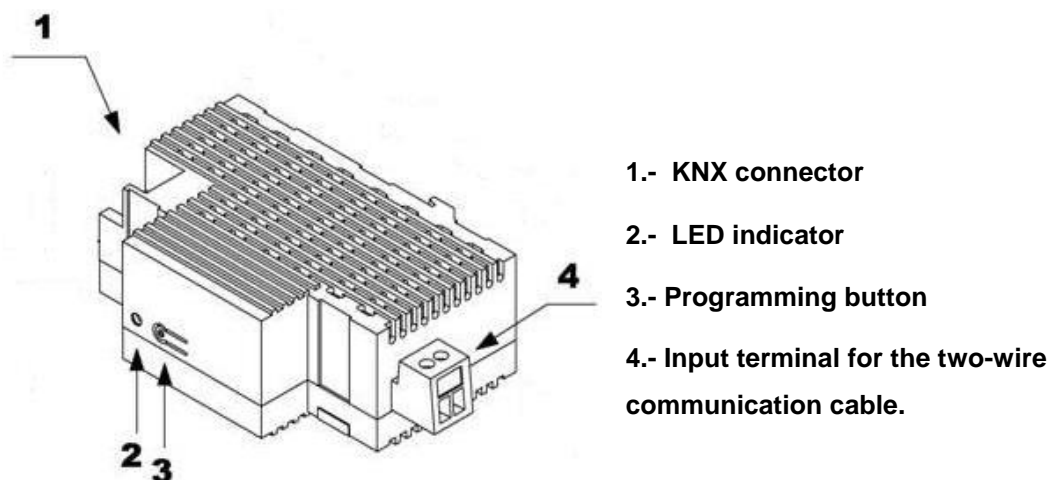4.- Input terminal for the two-wire communication cable.

Figure 1. Element scheme

KLIC-DI connects to the KNX bus via the corresponding built-in terminals (1). On the other hand, this device is connected to the internal PCB board of the A/C unit (P1/P2 connectors), using a 2-wire cable. See Figure 2.

> **Important**: *in case of aiming to control the air conditioning both through KLIC-DI and through the incorporated wired remote control of the actual unit, please refer to the "Control types" subsection, under section 2.2 in order to ensure that both of them have been properly configured.*

Once the device is provided with power supply from the KNX bus, both the physical address and the desired KLIC-DI application programme can be downloaded.

This device does not need any additional external power as it is entirely powered through the KNX bus.

The functionality of the main elements is explained below:

- **Programming button (3)**: a short press on this button will set the device into the programming mode, making the red component of the LED (2) indicator light up. If the button is held while plugging the device into the KNX bus, KLIC-DI will go into secure mode, making the red colour of the LED blink intermittently.

- **LED indicator (2)**: three-colour (red, blue and green) light indicator that reflects the current state of the device. Apart from showing whether the device is under the programming or secure modes, this LED will also show

react to the communication between KLIC-DI and the A/C unit, which may be particularly useful during the installation process. The meaning of the different colour components is explained next:

➢ **Red component (still)**: KLIC-DI is under the programming mode.

➢ **Red component (blinking)**: KLIC-DI is under the secure mode.

➢ **Green component (still)**: KLIC-DI is not connected to the A/C unit, or the A/C unit is disconnected from the power supply.

➢ **Green component (blinking)**: transmission or data flow from the A/C machine towards KLIC-DI.

➢ **Blue component (blinking)**: transmission or data flow from KLIC-DI towards the A/C machine.

Note: *each colour component works with independence of the others. Therefore, for example, if KLIC-DI is set into the programming mode being the A/C unit disconnected, the perceived colour will be typically a still orange, as the red and green components are lighting (still).*

● **Input terminal for the two-wire communication cable (4)**: slot for the connection of the two-wire communication cable that will connect KLIC-DI to the A/C unit. The other end of the cable, therefore, is intended to be connected to the P1/P2 ports from the PCB board of the internal unit, or from the wired remote control of the A/C unit.
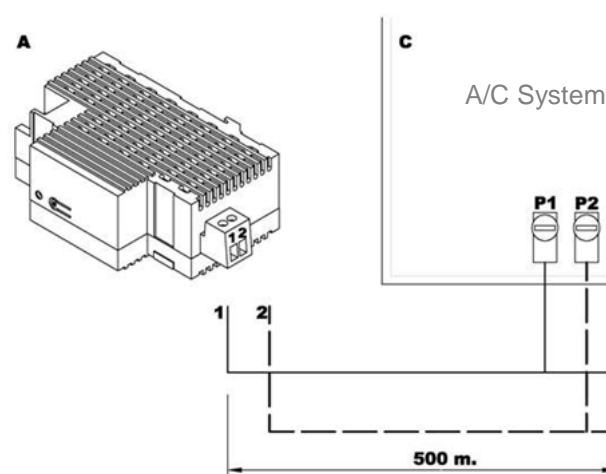

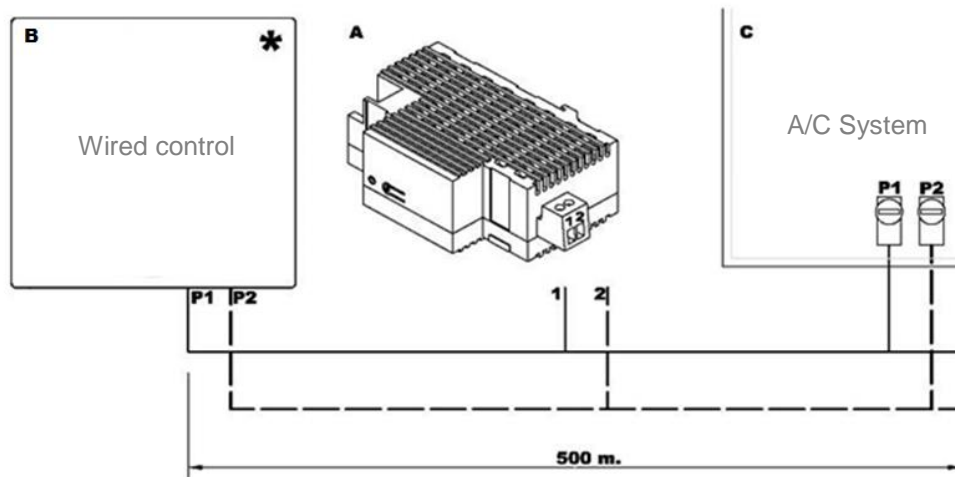**Figure 2.** Connecting KLIC-DI to the P1/P2 bus (master mode).

Figure 3. Connecting KLIC-DI to the P1/P2 bus with a wired remote control (slave mode)

Connection Diagram Legend	
A	KLIC-DI
B	Wired control
C	A/C unit
P1-P2	Connection base for the A/C unit
1-2	Zennio input terminal
*	The wired remote control needs to work contrary to the mode (slave/master) set for KLIC-DI. See section 2.2.

For detailed information about the technical features of KLIC-DI, as well as on security and installation procedures, please refer to the device **Datasheet**, included within the device packaging and also available at http://www.zennio.com. Reading the KLIC-DI **installation note**, available at the same website, is also encouraged.

Note: *sections below this point will focus on the KLIC-DI VRV application program for variable refrigerant volume machines, and its specific configuration. Please refer to the KLIC-DI SKY user manual in case of running that particular application program.*

2 CONFIGURATION

2.1 BASIC CONTROL

KLIC-DI allows controlling and monitoring an air-conditioning unit the same way it would be through the wired remote control provided with it.

Through the KNX bus, the following basic functionalities of the air conditioning unit can be controlled:

- **ON/OFF** switch of the air-conditioning unit.

- **Temperature setpoint** between 16 and 32 ºC.

- **Operation mode**: Automatic, Heat, Cool, Fan and Dry.

- **Fan speed**: configuration of 2 or 3 speed levels.

  > **Important**: *check which levels are provided by the A/C unit.*

- **Swing function**: still slat positions or continuous motion.

These functionalities imply changes in the state of the machine, which are periodically sent to KLIC-DI. When KLIC-DI receives from the machine a state different to the previous one, it updates the status objects and sends them to the KNX bus.

2.2 ADVANCED FUNCTIONALITY

Apart from basic control functions over the air-conditioning system, KLIC-DI offers other advanced functionalities that provide added value to the wired remote control:

- **Scene configuration**: allows establishing a specific parameter combination to be sent to the machine in order to generate a determined climate ambient. KLIC-DI allows configuring up to 4 different scenes.

- **Temporary switch-off**: allows an automatic and temporary switch-off of the machine (after a pre-established delay, if set up) when the communication object associated to this function changes its value. A typical application of this functionality is linking a window sensor to the automatic switch-off object, which will make KLIC-DI switch the machine off while the window is open.

- **Setpoint restriction**: temperature setpoints of variable refrigerant volume air conditioning systems are typically limited to the range 16-32ºC (please refer to the user manual of the actual unit). This function of the KLIC-DI device allows configuring custom temperature ranges in ETS for the Heat and Cool modes, provided that the custom values stay within the original range. In case of receiving a temperature command from the KNX bus with a value exceeding the configured range, the temperature value sent by KLIC-DI to the machine will be the corresponding limit value.

- **Internal Temperature** and **Reference Temperature**: variable refrigerant volume A/C units incorporate several sensors for measuring the temperature at different internal points. KLIC-DI monitors one of them, referred to as **internal temperature**, and makes use of it to inform the KNX bus through the "**Internal Temperature (status)**" communication object.

  On the other hand, through the "**Reference Temperature**" object, KLIC-DI is able to receive periodical temperature values from the KNX bus, as measured by an external sensor. These values will be afterwards sent to the air-conditioner machine, which may eventually use them for internal calculation. This reference temperature object just works when KLIC-DI is master and assigns a default value of 25ºC.

  Important: *The Daikin indoor units have three different ways to be programmed in regards with the ambient temperature sensor. This configuration must be done by a Daikin qualified technician or installer.*

  1) *The indoor unit uses its own return temperature when there is a big difference between the ambient temperature and the setpoint temperature. The ambient temperature will be used from the Master device (remote controller, or KLIC-DI device) when this difference is small.*

  2) *The indoor unit uses its own return temperature.*

  3) *The indoor unit is only used the ambient temperature from the Master device (Daikin remote controller, or KLIC-DI device).*

- **Error management**: allows sending messages to the KNX bus informing about errors. Error management handles both external errors from the A/C unit itself and those that may arise in the KLIC-DI – A/C unit communication process.

  Apart from reporting external errors, a numerical code associated with them is also provided and must be consulted in the specific user manual of the installed air-conditioning system, according to ANNEX II: Correspondence with A/C unit error codes.

- **Initial configuration**: allows establishing the desired initial parameters for the state of the A/C unit after downloading or restarting the device from ETS, or after recovering from a bus failure. The following may be configured: ON/OFF state, temperature, mode, fan and swing of the machine. It is also possible to send the initial values to the KNX bus after the start-up.

- **Control type**: permits defining the control type, *master* or *slave*, that KLIC-DI will work according to (**important when KLIC-DI will be used together with the wired remote control of the A/C unit**).

  The master control type will correspond to the device directly communicating with the machine. It will also be in charge of retransmitting the instructions to the slave control, if any. This configuration will still permit controlling the machine from the slave control.

  This feature allows connecting to the same installation both the KLIC-DI interface and the wired remote control of the A/C unit.

  > **Important**: *in case of having KLIC-DI and the wired remote control operating together, please, make sure that the control type of both devices is not the same (necessarily one of them must be master and the other slave).*

  Notes:

  - *Switching the wired control between the slave and master modes requires interrupting the power supply in order to make the wired control re-initialise under the new mode.*

  - *If the power supply of the wired control fails, it may be necessary to disconnect and reconnect the bus voltage of the device after the power*

supply has been restored in order for the configuration between the wired control unit and the KLIC DI to be successful (especially if the KLIC DI has been configured as master and the wired control as slave).

- **Mode control type**: devices configured as a master (note that this does not apply to devices configured as a slave) may also act as a *master of mode* or as a *slave of mode* in case multiple indoor units are connected to the same outdoor unit, which causes restrictions in the working modes of the indoor units depending on that selected in the outdoor unit. The configuration of such situation is detailed in section 3.2.6.

2.3 TESTING KLIC-DI FROM AN IR REMOTE

KLIC-DI incorporates –next to the LED indicator– an infrared receiver that may be used together with any of the Zennio IR remotes (such as models ZN1IRZ38 and ZN1IRZAS) to check the proper control of the A/C machine from KLIC-DI.

Note: *KLIC-DI will only respond to infrared orders under the programming mode (i.e., with the red component of the LED on).*

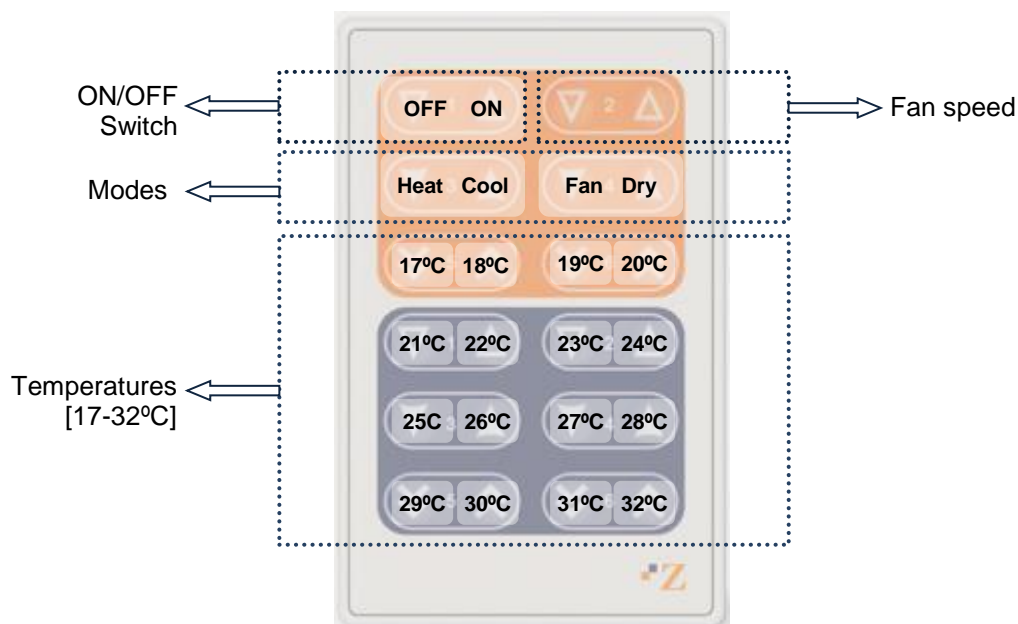The action performed by each button of the IR control is shown in Figure 4.

Figure 4. Testing KLIC-DI from the IR remote

3 ETS PARAMETERISATION

To begin with the parameterisation process of the KLIC-DI interface it is necessary, once the ETS programme has been opened, to import the database of the product (**KLIC-DI VRV** application programme).

Next, the device should be added to the project. The configuration process begins by entering the Parameters tab of the device.

In the following sections a detailed explanation is provided about how to parameterise the different functionalities of the device in ETS.

3.1 DEFAULT CONFIGURATION

This section shows the default configuration the device configuration starts from.

	Number	Name	Object Function	De	Gr	Length
■↯	0	On/Off	Turn ON/OFF the machine			1 bit
■↯	1	Setpoint	Value sent to the machine			2 bytes
■↯	2	Mode	0=Aut;1=Ht;3=Cool;9=Fan;14=Dry			1 byte
■↯	3	Fan [1byte]	0-50%=Low;51-100%=High			1 byte
■↯	5	On/Off (status)	Machine State (ON/OFF)			1 bit
■↯	6	Setpoint (status)	Val. received from the machine			2 bytes
■↯	7	Mode (status)	Current Mode:0=Auto;1=Heat...			1 byte
■↯	8	Fan [1byte] (status)	50%Min;100%Max			1 byte
■↯	28	Internal Temperature (status)	Temp. from the internal sensor			2 bytes
■↯	29	Reference Temperature	Temp. from the external sensor			2 bytes

Figure 5. Default topology

The default topology window (Figure 5) contains the communication objects associated to the reception of the control orders for the basic operation of the A/C unit: on/off, setpoint temperature, mode and fan. In addition, the corresponding status objects (which will report the updated state values of the A/C system to the KNX bus) are also shown.

When entering the parameter edition for the first time, the following window will be shown.

Figure 6. Default general configuration

As shown in Figure 6, the configuration window is initially divided into three main tabs:

- **General**: allows individually enabling the control over the advanced functionalities of the A/C unit.

- **Mode**: allows configuring different attributes related to the selection of the mode of operation of the A/C unit.

- **Fan**: allows configuring features related to the fan speed of the A/C unit.

The next sections cover all of the above in detail.

3.2 GENERAL

From the General parameter window, it is possible to select the advanced functionalities to be controlled from KLIC-DI (scenes, setpoint restriction, auto OFF, error handling, initial configuration…). All of them, which will be explained in the next section, are disabled by default.

From the General window it is also possible to configure the desired **control type** for KLIC-DI (master control or slave control) and the **indoor temperature sending time** (30 – 255, in seconds), which allows carrying out a periodical sending to the KNX bus (through the "**Internal Temperature (Status)**" object) of the internal temperature measured by the machine, even if the value does not change.

3.2.1 SCENES

After enabling this function, the left menu will show a new tab named Scenes, from where it will be possible to set up different scenes (up to 4), consisting each of them in a set of orders to be sent to the A/C unit upon the reception, through the KNX bus and by means of the object "**Scenes: Receive**", of the corresponding scene value (decreased by 1, according to the KNX standard).
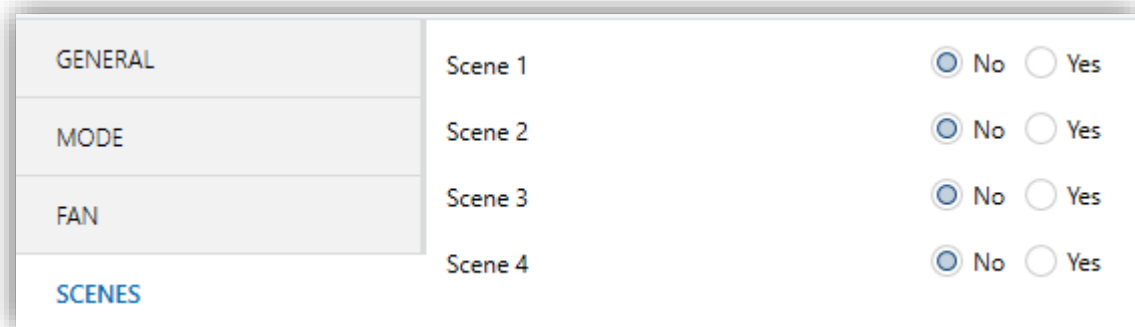
Figure 7. Scene configuration

For every enabled scene, the particular parameters that may be configured are the following:

- **Scene number.** Sets the scene number (1-64) on whose reception (through the Scenes object, decreased by one) the corresponding configured orders will be sent to the A/C machine. The available orders are:

  - ➢ **On/Off.** Brings the possibility of setting the A/C machine state: No change, on or off.

  - ➢ **Temperature.** No change, or a New temperature setpoint (from 16ºC to 32ºC).

  - ➢ **Mode.** No change, Auto, Heat, Dry, Fan or Cool.

  - ➢ **Fan.** No change, minimum or maximum.

  - ➢ **Swing.** No change, swing (in motion) or in any of the five fixed positions available.

An example of scene configuration is shown in Figure 8.

Figure 8. Scene configuration example (Scene 1)

3.2.2 SETPOINT RESTRICTION

The A/C unit imposes restrictions to the temperature setpoint (typically, only values in the range 16ºC - 32ºC are available). Nevertheless, KLIC-DI offers the possibility of establishing new setpoint temperature limits provided that they are still within the A/C unit predefined limits (please refer to the A/C unit user manual for details).

Setpoint restriction can be customised independently for the two modes of operation that require a temperature setpoint: Cool and Heat.

Figure 9. Setting setpoint restrictions.

Important: *to make KLIC-DI apply these customised limits, the specific "**Setpoint Restriction**" communication object must be set to "1" (the value is "0" after the device starts up). To control the machine back with the predefined temperature limitations, the mentioned object needs to be sent the value "0".*

Once the new setpoint temperature restriction has been established for every mode and the functionality has been enabled, when an out-of-range value is received from the KNX bus, the A/C machine will actually be sent a value equal to the corresponding setpoint restriction (thus, truncating the out-of-range value).

3.2.3 AUTO OFF

This option allows an automatic and temporary switch-off of the A/C machine if the associated communication object (**Auto-OFF**) changes its value from "0" to "1" due to any eventuality (this is typically intended to work together with an open/closed window sensor). If the A/C machine was already off, the Auto-OFF will still apply, so the machine will remain off until this situation is over.

Figure 10. Auto OFF

The only configurable parameter is:

- **Delay for Auto-OFF**: sets the time, in seconds, KLIC-DI waits before automatically switching the A/C machine off. Any OFF order received during the delay, will abort the delay and will apply the Auto-OFF immediately.

Once the Auto-OFF object acquires the value "1", any ON order will not be sent to the machine until the object "Auto-OFF" acquires the value "0". However, any other control orders (setpoint, fan speed, etc.) received during the open window state will in fact be taken into account by KLIC-DI and applied afterwards, once the Auto-Off object is back set to "0" (which will set the machine back to the state it had prior to the Auto-OFF).

Note: *switch-on orders sent to the A/C unit from a wired remote control configured as a master will not be ignored during the open window state (Auto-OFF=1), as KLIC-DI has no authority over the wired remote control. In such case, the Auto-OFF will be aborted (Auto-OFF=0).*

3.2.4 ERROR HANDLING

From this parameter window it is possible to enable the sending of messages to the KNX bus to report the occurrence of errors, including both internal errors regarding the communication between KLIC-DI and the A/C unit, and external errors affecting the A/C unit itself.

Figure 11. Configuring the error handling.

It is possible to select whether to report none, internal, external or both types of error:

- **Internal errors**: when enabled, a new communication object shows up, "**Internal Error: Communication**" (1-Bit), which indicates if there is a problem in the communication between the KLIC-DI and the A/C unit or there that there is no unit connected. Thus, if its value is "1", there is an error; and if it is "0", there is no error.

  > **Note:** *If an internal error communication is active, the next actions are recommended:*
  >
  > 1. *If there is a remote wired control in the installation, check whether it reports any error.*
  >
  > 2. *Verify that KLIC-DI is properly connected to the A/C unit.*
  >
  > 3. *Verify that control configuration is correct. Check that the device and the remote wired control are not both configured as slaves.*
  >
  > 4. *If internal error is still active, please, contact with Zennio support.*

- **External errors**: when enabled, two new communication objects show up: "**External Error**" (1-Bit) and "**Type of external error**" (1-Byte). The first one indicates if an external error is active (value "1") or not (value "0"). The second object indicates the specific code that identifies the error (please refer

to the specific user manual of the A/C unit and to ANNEX II: Correspondence with A/C unit error codes).

Important: *in case of configuring KLIC-DI as master to operate together with the wired remote control, error handling functionality must be enabled in order not to cause an abnormal control or behaviour of the air machine.*

3.2.5 INITIAL CONFIGURATION

This functionality allows setting the desired initial state that KLIC-DI will send the A/C unit after downloading or restarting the device from ETS, or when recovering from a KNX bus failure. This state can be the one by default or a custom state. If the latter is selected, the window in Figure 12 will be shown.

Figure 12. Initial configuration

The variables whose initial state can be set are:

- **On/Off**: last (the state the machine had before the power failure; after an ETS download or reset, this will be assumed to be OFF), ON or OFF.

- **Temperature**: last or custom (a new field appears to set the custom initial temperature setpoint, between 16ºC and 32ºC). Initially, the last value is assumed to be 25ºC.

- **Mode**: Last, Auto, Heat, Dry, Fan or Cool. Initially, the "last" value is assumed to be Cool.

- **Fan**: Last, Minimum or Maximum. Initially, the "last" value is assumed to be Minimum.

- **Swing**: Last, In motion or in any of the 5 fixed positions available.

Moreover, the status objects can be sent to the bus when applying the initial settings:

- **Send initial configuration to bus?**: If enabled ("Yes"), a new field will appear next, "**Delay**", where to configure the time, in seconds, KLIC-DI will delay the sending of the status objects to the KNX bus.

  Note: *if the parameterised delay is too short, the status objects sent to the bus may not show the selected custom configuration. In such case, an additional transmission of the objects will take place once the custom configuration becomes effective and has been confirmed by the machine.*

3.2.6 TYPE OF CONTROL

The control type of the KLIC-DI interface is also parameterised from the General window. This can be **Master Remote Control** or **Slave Remote Control**, depending on whether or not there is an additional wired remote control in the A/C system bus. Please refer to the "Control type" subsection under section 2.2.

On the other hand, when the control type is set to **Master Remote Control**, an additional drop-down list ("**Master/Slave of Mode**") is displayed. Note that it only makes sense to configure the device as a Master of Mode or as a Slave of Mode once it has been set as a Master Remote Control.

The concept of the Master of Mode derives from the possibility of having multiple indoor A/C units within the same facility (e.g., one per floor), all of them connected to a single outdoor unit, which typically means that (unless a BS box has been installed) **only one main mode can be active at a time**, and therefore only one internal unit may work as a master of mode, being the only one capable of switching the active mode. The remaining indoor units (and their respective master or slave controls) will act as slaves of mode, thus will only have certain modes available, depending on the currently active main mode.
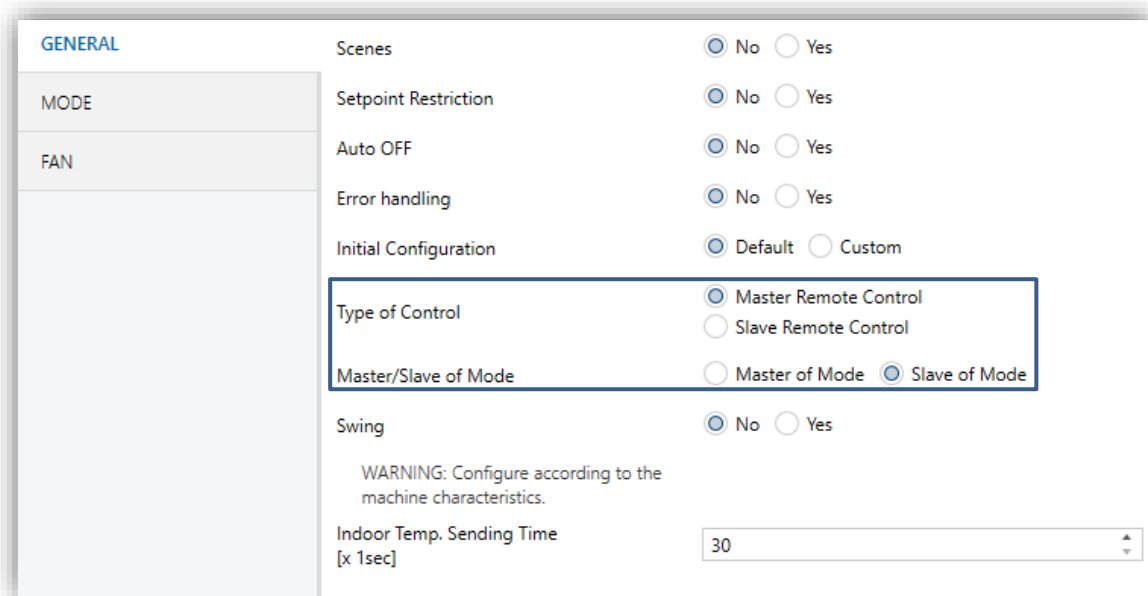
Figure 13. Configuring the control type.

That being said, it is possible to configure KLIC-DI as a master of mode or as a slave of mode through the "**Master/Slave of Mode**" parameter, once it has been configured as a Master Remote Control.

Table 1 shows the different modes that can be selected from the device depending on whether it is configured as a master of mode or as a slave of mode. Note that in case of acting as a slave of mode, the available modes will depend on the mode currently under selection by the master of mode.

Modes available for selection								
Master of mode	Cool			Heat		Fan	Dry		
Slave of mode	Cool	Fan	Dry	Heat	Fan	Fan	Cool	Fan	Dry

Table 1. Configurable modes from a master of mode and from a slave of mode

The following cases describe how the behavior of the slave of mode is conditioned by cooling/heating mode switchovers:

- Being the exterior unit in the **cool** mode, if the KLIC-DI that controls the slave of mode unit sends the **heat** mode then the slave of mode unit will switch to the **fan** mode.

- Being the exterior unit in the **cool** mode, the internal unit in the **dry** or **fan** modes, if the KLIC-DI that controls the slave of mode unit sends the **heat** mode then the slave of mode unit will switch to **cool** mode.

- Being the exterior unit in the **heat** mode, if the KLIC-DI that controls the slave of mode unit sends the **cool** mode then the slave of mode unit will switch to **the fan** mode.

- Being the exterior unit in the **heat** mode, the internal unit in the **fan** modes, if the KLIC-DI that controls the slave of mode unit sends the **cool** mode then the slave of mode unit will switch to **heat** mode.

Note: *when KLIC-DI is configured as the master of mode, the wired remote controls of the A/C unit cannot be used to set additional masters of mode.*

3.2.7 SWING

Through this parameter, it is possible to select whether to permit controlling the swing function (i.e., the slats that address the air flow) of the A/C machine. The availability of such function in the particular A/C unit being controlled needs to be confirmed in advance.

> **Important**: *in case of not being available swing control in the machine, enabling this parameter may cause an abnormal behaviour of the air machine.*

Figure 14. Swing

The control of the swing function is performed by assuming up to **five fixed positions**, and an option to make the slats stay permanently in motion or still.

After enabling this parameter ("Yes"), two one-byte communication objects show up: "**Swing [1byte]**" and "**Swing [1byte] (status)**", as well as the following two 1-bit objects: "**Swing [1 bit]**" and "**Swing [1bit] (status)**". By means of this set of objects it is possible to implement the reception of control orders from the bus, and a later report of the updated state of the machine.

- The "**Swing [1 bit]**" 1-bit object permits controlling the slat position as follows:

  ➢ **Sending the value "0"**: if the slats are at a still position, they switch to the following one, according to the following cyclical sequence: Fixed Position 1 – Fixed Position 2 – … – Fixed Position 5 – Fixed Position 1… In case of being in motion (swinging), the slats will switch back to the last still position they had before entering the swing mode.

  ➢ **Sending the value "1"**: the slats begin to move continuously.

  The "**Swing [1bit] (status)**" object indicates the current slats state: swing (value "1") or still (value "0").

- The "**Swing [1byte]**" 1-byte object allows setting a particular slat position in terms of percentage, according to Table 2.

  The status object ("**Swing [1byte] (status)**") indicates the current slats state, as a percentage.

Value of the "Swing [1 byte] Sending" object	Position number	Value of the "Swing [1 byte] Reception" object
0%	Position 1	0%
1-20%	Position 2	20%
21-40%	Position 3	40%
41-60%	Position 4	60%
61-80%	Position 5	80%
81-100%	Swing	100%

Table 2. Swing function

Note: *on certain A/C unit models, positions 3-5 may not be available under the Cool mode, as a measure to prevent that a cold air flow is outputted directly to particular points of the room where people are supposed to stand. Analogously, positions 1 and 2 may not be permitted by the A/C unit under the Heat mode, to prevent hot air accumulation on the top of the room.*

3.2.8 INDOOR TEMPERATURE SENDING TIME

The "**Indoor Temp. Sending Time**" parameter permits defining a period, between 30 and 255 seconds, to cyclically send the internal temperature measured by the A/C machine itself and sent to KLIC-DI during the internal communication process. This value will be sent to the KNX bus through the "**Internal Temperature (status)**" object. Note that it will be sent even if the value is equal to the last one sent, and that in the event of non having a built-in sensor in the machine for performing this measure, abnormal values may be sent to the bus.

3.3 MODE

As explained in section 3.1, the Mode specific window allows configuring the type of the communication objects that will be required for controlling the mode of operation of the A/C machine.

Figure 15. Mode window

- **Auto Mode**: defines whether the "Auto" mode is available in the A/C unit or not. If set to "Yes", KLIC-DI will switch the unit to that mode on the arrival of the value "0" through the "**Mode**" object (and of the value "1" through "**Auto Mode**", in case of having activated the "**Individual Modes**" parameter, explained below). Afterwards, KLIC-DI will confirm that the unit has switched to the "Auto" mode by sending the "**Mode (Status)**" object as well as, if enabled, the "**Auto Mode (Status)**" object.

In case of leaving this option disabled, any orders received that imply switching to mode "Auto" will be ignored. This not only affects to the aforementioned objects, but also to scenes consisting in switching to the "Auto" mode, as well as to the custom initial configuration.

Note: *wired control models BRC1E51A7, BRC1E52A7 and BRC1E53A7 do not send the mode "Auto" to the A/C unit (they will only send Cool or Heat depending on which is appropriate for each case), even if the wired control itself does show such mode as active. Consequently, the status objects of KLIC-DI VRV will only notify the modes Cool and Heat when an order to switch to mode Auto is sent from the wired control. The same will happen if sent from KLIC-DI VRV working as a slave.*

- **Individual modes**: selecting this option brings ten new 1-bit communication objects, four of which will be associated to the reception, from the KNX bus, of mode switch orders (**Auto**, **Cool**, **Heat**, **Fan** and **Dry**, respectively) while the other five will be used by KLIC-DI to inform the KNX bus about the updated state of each function, as it is sent by the A/C machine.

    In case of having activated the **Individual modes** option, it will be possible to switch from one mode to another by simply sending the value "1" to the control object corresponding to the new mode. After that, KLIC-DI will acknowledge the new mode by sending a "1" through the status object (unless the machine has, for whatever reason, not changed the mode).

    Equivalently, the "**Mode**" and "**Mode (status)**" one-byte objects are available by default and permit switching between the different modes of operation as well as checking the currently active mode, respectively.

- **Simplified mode**: enabling this option activates the "**Simplified Mode**" 1-bit object. This object allows switching from the Cool and the Heat modes by respectively sending the values "0" or "1" to the object. Associated to this control object, a status object is also enabled. It will acquire the value "0" for modes **Cold** and **Dry**, and the value "1" for mode **Heat**. Switching to the **Fan** mode does not change the value of this object.

3.4 FAN

This window configures several features related to the fan speed (or the volume of the air flow) of the A/C machine.
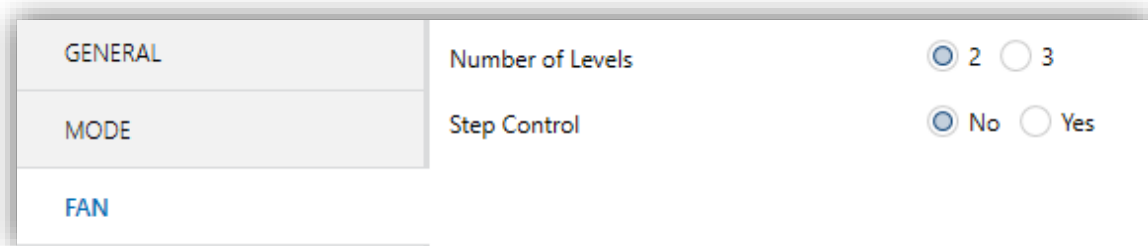
Figure 16. Fan

- **Number of levels**: allows specifying the number of the fan levels distinguished by the A/C unit, which may be **2 or 3 levels**. The fan speed is related to two 1-byte objects: "**Fan [1byte]**" and "**Fan [1byte] (status)**", for controlling and reporting the fan speed, respectively. The control orders are to be received from the KNX bus as percentage values, which will be then interpolated according to the specification explained below. The same interpolation will be applied over the values sent by KLIC-DI through the status object.

  ➢ **Two levels**: the values will be interpolated according to Table 3.

Initial Speed Percentage	Interpolated Speed Percentage	Level
0-50%	50%	Minimum
51-100%	100%	Maximum

Table 3. Fan speed percentage for two levels

  ➢ **Three levels**: the values will be interpolated according to Table 4.

Initial Speed Percentage	Interpolated Speed Percentage	Level
0-33%	33%	Minimum
34-67%	67%	Middle
68-100%	100%	Maximum

Table 4. Fan speed percentage for three levels

> **Important**: *the number of levels must match with the number of levels of the A/C machine.*

- **Step control**: enabling this feature ("Yes") brings up the "**Fan [1bit]**" one-bit object, which allows increasing (by sending the value "1") or decreasing (value "0") the fan speed by one level (for example, under a three-level parameterisation and under the minimum fan speed level, the value "1" sent via the "Fan [1bit] sending" object will make the fan speed level change to "medium").

The step control is **non-cyclical**. This means that, being at the minimum level (33% or 50%), any decrease order will be ignored by the unit, which will maintain the same fan level unless an order to increase it is received. Analogously, when the fan speed is at its maximum (100%), it will remain unchanged until a decrease order is received.

ANNEX I. COMMUNICATION OBJECTS

- "**Functional range**" shows the values that, with independence of any other values permitted by the bus according to the object size, may be of any use or have a particular meaning because of the specifications or restrictions from both the KNX standard or the application programme itself.

Number	Size	I/O	Flags	Data Type (DPT)	Functional Range	Name	Function
0	1 Bit	I	C - - W U	DPT_Switch	0/1	On/Off	Turn ON/OFF the machine
1	2 Bytes	I	C - - W U	DPT_Value_Temp	16ºC – 32ºC or ac. to param.	Setpoint	Value sent to the machine
2	1 Byte	I	C - - W U	DPT_HVACContrMode	0=Auto, 1=Heat 3=Cool, 9=Fan 14=Dry	Mode	0=Auto;1=Ht;3=Cool;9=Fan;14=Dry
3	1 Byte	I	C - - W U	DPT_Scaling	0%-50% Low 51%-100% High	Fan [1byte]	0-50%=Low;51-100%=High
	1 Byte	I	C - - W U	DPT_Scaling	0%-33% Min. 34%-67% Med, 68%-100% Max.	Fan [1byte]	0-33%Min;34-67%Mid;>68%Max
4	1 Bit	I	C - - W U	DPT_Switch	0/1	Swing	0=Among fixed pos.;1=Motion
5	1 Bit	O	C T R - -	DPT_Switch	0/1	On/Off (status)	Machine State (ON/OFF)
6	2 Bytes	O	C T R - -	DPT_Value_Temp	16ºC – 32ºC or ac. to param.	Setpoint (status)	Value received from machine
7	1 Byte	O	C T R - -	DPT_HVACContrMode	0=Auto ... 14=Dry	Mode (status)	Current Mode: 0=Auto;1=Heat...
8	1 Byte	O	C T R - -	DPT_Scaling	33%/67%/100%	Fan [1 byte] (status)	33%Min;67%Mid;100%Max
	1 Byte	O	C T R - -	DPT_Scaling	50%/100%	Fan [1 byte] (status)	50%Min;100%Max
9	1 Byte	O	C T R - -	DPT_Scaling	0% Posit. 1 20% Posit. 2 40% Posit. 3 60% Posit. 4 80% Posit. 5 100% In mot.	Swing [1byte] (status)	0-80%=Fixed pos.,100%=Motion
10	1 Bit	I	C T - W U	DPT_Switch	0/1	Auto Mode	1=Set Auto Mode;0=Nothing
11	1 Bit	I	C T - W U	DPT_Switch	0/1	Cool Mode	1=Set Cool Mode;0=Nothing

Number	Size	I/O	Flags	Data Type (DPT)	Functional Range	Name	Function
12	1 Bit	I	C T - W U	DPT_Switch	0/1	Heat Mode	1=Set Heat Mode;0=Nothing
13	1 Bit	I	C T - W U	DPT_Switch	0/1	Fan Mode	1=Set Fan Mode;0=Nothing
14	1 Bit	I	C T - W U	DPT_Switch	0/1	Dry Mode	1=Set Dry Mode;0=Nothing
15	1 Bit	I	C - - W U	DPT_Switch	0/1	Simplified Mode	0=Cool;1=Heat
16	1 Bit	O	C T R - -	DPT_Switch	0/1	Auto Mode (status)	1=Auto Mode Enabled;0=Disabled
17	1 Bit	O	C T R - -	DPT_Switch	0/1	Cool Mode (status)	1=Cool Mode Enabled;0=Disabled
18	1 Bit	O	C T R - -	DPT_Switch	0/1	Heat Mode (status)	1=Heat Mode Enabled;0=Disabled
19	1 Bit	O	C T R - -	DPT_Switch	0/1	Fan Mode (status)	1=Fan Mode Enabled;0=Disabled
20	1 Bit	O	C T R - -	DPT_Switch	0/1	Dry Mode (status)	1=Dry Mode Enabled;0=Disabled
21	1 Bit	I	C - - W U	DPT_Step	0/1	Fan [1bit]	0=Down;1=Up
22	1 Byte	I	C - - W U	DPT_Scene_Control	0-63	Scenes: Receive	Selected Scene Value
23	1 Bit	I/O	C T R W U	DPT_Switch	0/1	Setpoint Restriction	0=Disable;1=Enable
24	1 Bit	I	C - - W U	DPT_Switch	0/1	Auto-OFF	0=Disable;1=Enable
25	1 Bit	O	C T R - -	DPT_Switch	0/1	Internal Error: Communication	0=No Error; 1=Error
26	1 Bit	O	C T R - -	DPT_Switch	0/1	External Error	0=No Error; 1=Error
27	1 Byte	O	C T R - -	non-standardized datapoint type	1-239	Type of External Error	Check Error's Table
28	2 Bytes	O	C T R - -	DPT_Value_Temp	0ºC – 99ºC	Internal Temperature (status)	Temp. from internal sensor
29	2 Bytes	I	C - - W U	DPT_Value_Temp	0ºC – 99ºC	Reference Temperature	Temp. from external sensor
30	1 Byte	I	C - - W U	DPT_Scaling	0% Posit. 1 1-20% Posit. 2 21-40% Posit. 3 41-60% Posit. 4 61-80% Posit. 5 81-100% In mot.	Swing [1byte]	0-80%=Fixed Pos.;100%=Mot.
31	1 Bit	O	C T R - -	DPT_Switch	0/1	Swing [1bit] (status)	0=Fixed Position; 1=Motion
32	1 Bit	O	C T R - -	DPT_Switch	0/1	Simplified Mode (status)	0=Cool; 1=Heat

ANNEX II: CORRESPONDENCE WITH A/C UNIT ERROR CODES

Correspondence between the error codes (in decimal form) sent to the KNX bus by KLIC-DI and the error codes of the A/C units themselves.

Bus	Code	Bus	Code	Bus	Code	Bus	Code	Bus	Code	Bus	Code	Bus	Code	Bus	Code	Bus	Code	Bus	Code
1	1	26	AA	51	E3	76	HC	101	J5	126	LE	151	U7	176	30	201	49	226	62
2	2	27	AH	52	E4	77	HJ	102	J6	127	LF	152	U8	177	31	202	4A	227	63
3	3	28	AC	53	E5	78	HE	103	J7	128	P0	153	U9	178	32	203	4H	228	64
4	4	29	AJ	54	E6	79	HF	104	J8	129	P1	154	UA	179	33	204	4C	229	65
5	5	30	AE	55	E7	80	F0	105	J9	130	P2	155	UH	180	34	205	4J	230	66
6	6	31	AF	56	E8	81	F1	106	JA	131	P3	156	UC	181	35	206	4E	231	67
7	7	32	C0	57	E9	82	F2	107	JH	132	P4	157	UJ	182	36	207	4F	232	68
8	8	33	C1	58	EA	83	F3	108	JC	133	P5	158	UE	183	37	208	50	233	69
9	9	34	C2	59	EH	84	F4	109	JJ	134	P6	159	UF	184	38	209	51	234	6A
10	0A	35	C3	60	EC	85	F5	110	JE	135	P7	160	M0	185	39	210	52	235	6H
11	0H	36	C4	61	EJ	86	F6	111	JF	136	P8	161	M1	186	3A	211	53	236	6C
12	0C	37	C5	62	EE	87	F7	112	L0	137	P9	162	M2	187	3H	212	54	237	6J
13	0J	38	C6	63	EF	88	F8	113	L1	138	PA	163	M3	188	3C	213	55	238	6E
14	0E	39	C7	64	H0	89	F9	114	L2	139	PH	164	M4	189	3J	214	56	239	6F
15	0F	40	C8	65	H1	90	FA	115	L3	140	PC	165	M5	190	3E	215	57		
16	A0	41	C9	66	H2	91	FH	116	L4	141	PJ	166	M6	191	3F	216	58		
17	A1	42	CA	67	H3	92	FC	117	L5	142	PE	167	M7	192	40	217	59		
18	A2	43	CH	68	H4	93	FJ	118	L6	143	PF	168	M8	193	41	218	5A		
19	A3	44	CC	69	H5	94	FE	119	L7	144	U0	169	M9	194	42	219	5H		
20	A4	45	CJ	70	H6	95	FF	120	L8	145	U1	170	MA	195	43	220	5C		
21	A5	46	CE	71	H7	96	J0	121	L9	146	U2	171	MH	196	44	221	5J		
22	A6	47	CF	72	H8	97	J1	122	LA	147	U3	172	MC	197	45	222	5E		
23	A7	48	E0	73	H9	98	J2	123	LH	148	U4	173	MJ	198	46	223	5F		
24	A8	49	E1	74	HA	99	J3	124	LC	149	U5	174	ME	199	47	224	60		
25	A9	50	E2	75	HH	100	J4	125	LJ	150	U6	175	MF	200	48	225	61		

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